Global Biodiversity Database

Protocol Development – Commodity Linkages

Final Report
June 2007




Prepared for:

JOINT NATURE CONSERVATION COMMITTEE

Revision Schedule

Commodity Report
June 2007

Rev	Date	Details	Prepared by	Reviewed by	Approved by
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1 Introduction

1.1.1 The Joint Nature Conservation Committee (JNCC) is the statutory adviser to Government on UK and international nature conservation. Its work contributes to maintaining and enriching biological diversity, conserving geological features and sustaining natural systems. JNCC delivers the UK and international responsibilities of the four country nature conservation agencies - Council for Nature Conservation and the Countryside, the Countryside Council for Wales, Natural England and Scottish Natural Heritage[1].

1.1.2 The JNCC are leading the development of an Internet based resource that will enable decision makers to access and understand key data in the Sustainable Consumption and Production sector: the **Global Biodiversity Database** (GBD). Scott Wilson has been commissioned by the JNCC to prepare two protocols to establish a framework for linking biodiversity ecoregions to cultivated areas of commodity production (of commodities that are consumed by the UK) and to monetary input from 'UK plc'. Upon approval of these two protocols, Scott Wilson have completed a series of pilot case studies to illustrate and refine the method.

1.2 This report[2]

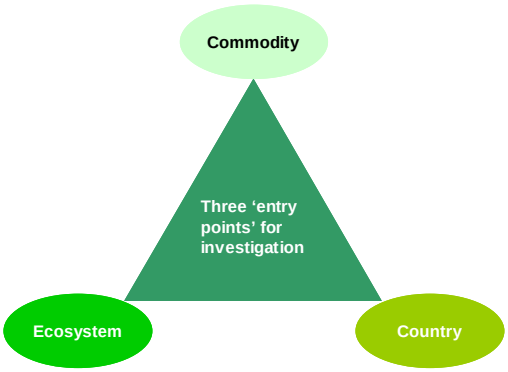
1.2.1 This study is composed of two documents. This, the first document contains:

1. The description of the methodology used to assess linkages. This includes sections describing outputs and flags issues that will need to be considered at each stage.
2. A selection of 'pilot' studies

1.2.2 The second document contains:

1. A separate excel database which includes:
    a. The confidence scores given for each pilot
    b. The figures regarding G200 ecoregions and their relative importance
    c. Maps of G200 ecoregions and areas of cultivation[3].

1.3 The database



1.3.1 The database is designed to have three entry points to access information; country, commodity and ecoregion, as illustrated. All the access points are cross-referenced with one another to ensure seamless transfer of the user to different information points.

1.3.2 The method follows a theoretical series of levels that are detail dependent (Figure 1.1).

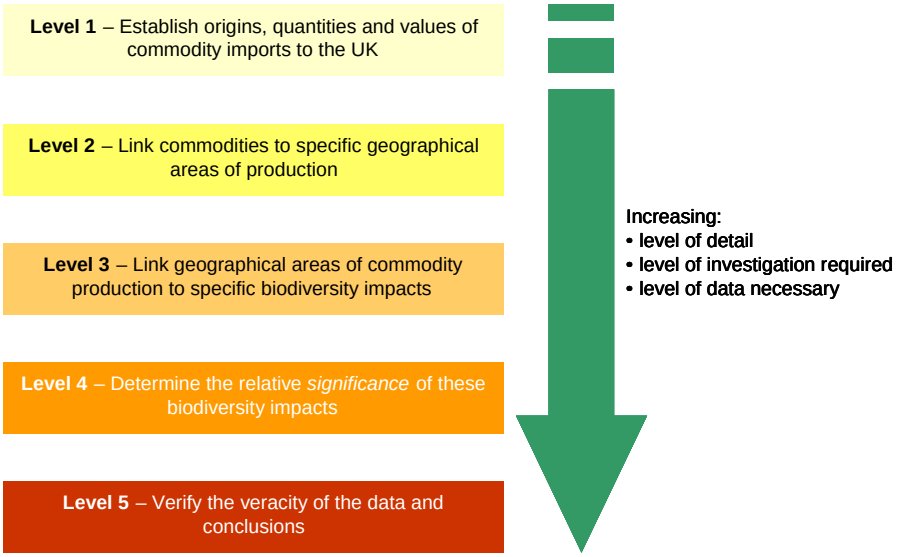


Figure 1.1: Level of analysis

[1] http://www.jncc.gov.uk/
[2] Note that there is a sister report to this on Business and Investment
[3] Where available

2 Methodology

Aim: To establish the relationship between end user consumption with areas of commodity cultivation and areas of high biodiversity value. To identify, where possible the degree of confidence for decision makers and any 'gaps' in information that would help to increase confidence levels.

2.1.1 The protocol consists of six steps combination a 'top-down' process (Steps 1-4) with a 'bottom-up' process (Steps 5-6). Whilst the approach is shown consecutively in Figure 2.1, it is not necessary that these stages be undertaken in this order.

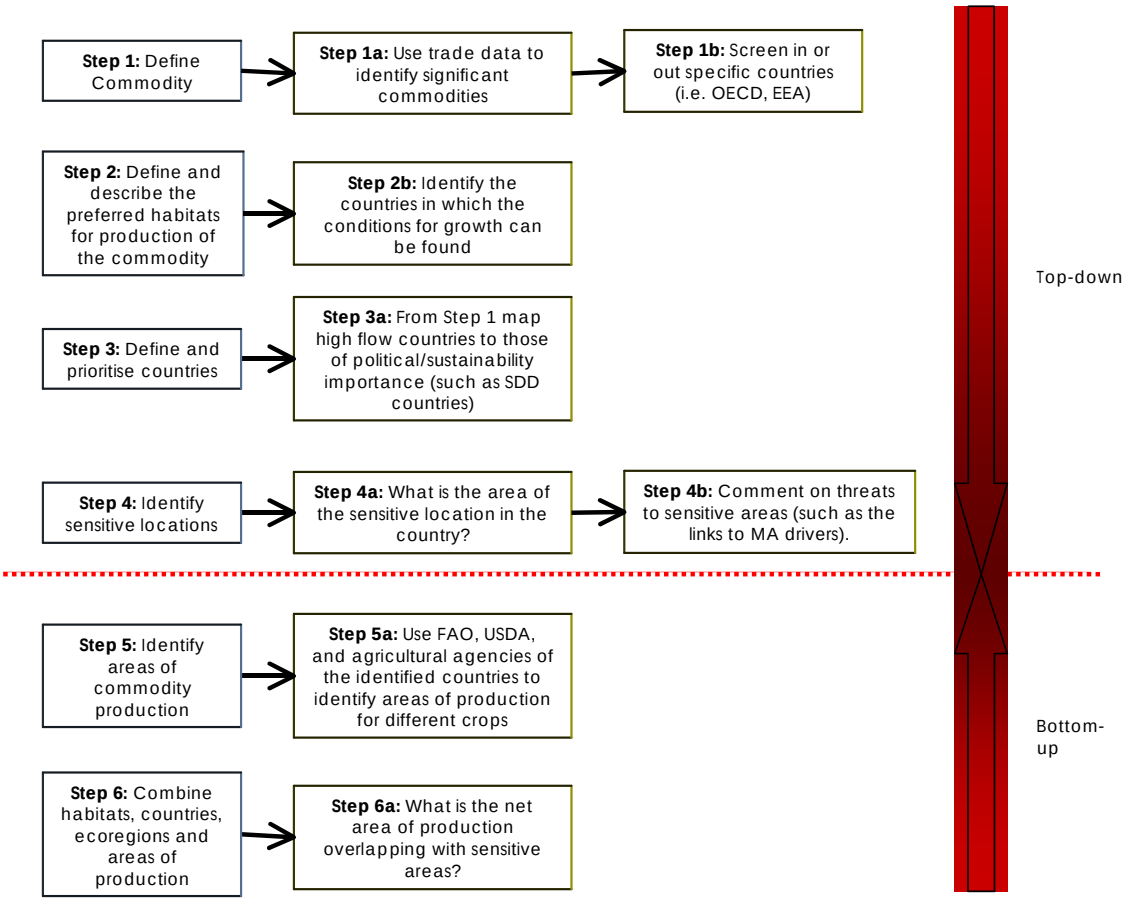


Figure 2.1: Commodities and ecoregions process

2.2 Step 1: Define commodity

2.2.1 Conventionally, commodities are split into a range of detail levels dependant on the amount of processing involved. These are often referred to as 'digit levels'. UNComtrade uses a number of classifications, including the Standard Industrial Trade

Classification (SITC) and Harmonised System (HS). Soya beans provide an example (see Table 2.1).

Table 2.1: Commodities and their derivative products[4].

Level of Detail		
Two digit	**Four digit**	**Six digit**
12 - Oil seeds and oleaginous fruits	1201 - Soya beans, whether or not broken.	120810 – Flours and meals of soya beans
21 – Miscellaneous edible preparations	2103 – Sauces and preparations therefor	210310 – Soya sauce
15 – Animal or vegetable fats and oils	1507 - Soya bean oil and its fractions	150710 – soya bean oil, crud, whether or not degummed, not chemically modified.

Considerations:

- What is the nature of the commodity? Does it have many derivatives e.g. cotton, that will lead to a complex supply chain or is it straight forward e.g. wine.
- Do the different derivatives have differing levels of commodity input, thus maybe skewing any attempts at determining the amount attributable to the UK e.g. cotton?

Outputs:

- Commodity shortlist based on defined prioritisation criteria

2.3 Step 2: Commodity conditions

2.3.1 Each commodity will have specific growth conditions in which their yield/productivity is optimum. It is import to establish the growth/production range of the commodity as this may have implications in regard to countries under production and the possibility of predicting future growth areas such as palm oil growth in sub-Saharan Africa.

Considerations:

- Does the commodity require narrow growth conditions i.e. it is inflexible where it grows? Have any attempts at genetic modification been made to widen its growing conditions e.g. soya?

Outputs:

- Spatially displayed, country specific information on locations for feasible crop growth.

2.4 Step 3: Country prioritisation

2.4.1 Given the broad locations established in Step 2, these should be cross-referenced with a list of established priority countries to establish the link with habitats. In this case, the JNCC had a list of priority countries prepared:

- Brazil
- South Africa
- India
- Latvia/Estonia/Russia
- Indonesia
- Malaysia
- Columbia

Considerations:

- Our consumption - is the country a significant trade partner to the UK?
- Our leverage - is the UK a significant trade partner to the exporting country?

Outputs

- Finalised list of priority countries, relative to commodity importance

2.5 Step 4: Identification of sensitive areas

2.5.1 In order to work towards an assessment of significance, it is essential that areas of biodiversity or sustainability importance be identified in the countries selected. There may be a number of designations for particular countries (such as national parks or areas of landscape value); these will need to be assessed on a case-by-case basis. This study focused on biodiversity and so the WWF's Global 200 ecoregions were used for this measure[5].

Box 1: WWF Global 200
The data for the WWF G200 ecoregions is readily downloadable in GIS compatible formats from the WWF website. In order to determine the G200 ecoregions and the area in km^2 the data was put into a GIS and then 'clipped' to the country boundaries. This enabled us to determine the 'gross' area but also the 'net' area within the country's borders.

2.5.2 A threat assessment was completed to establish the nature of the threat in specific ecoregions. The Millennium Ecosystem Assessment (MA) identifies five direct drivers for biodiversity loss (shown below), these were linked to the threats identified for each ecoregion (see spreadsheets).

1. **Habitat Change** - Historically, habitat and land use change have had the biggest impact on biodiversity across biomes. For terrestrial ecosystems, the MA

indicates that the most important direct driver of change in the past 50 years has been land cover change; only biomes relatively unsuited to crop plants, such as deserts, boreal forests and tundra remain relatively intact. Cultivated systems – defined in the MA to be areas in which at least 30% of the landscape is in croplands, shifting cultivation, confined livestock production or freshwater aquaculture in any particular year - cover 24% of the Earth's surface. Under the various scenarios developed by the MA , habitat loss caused by land use change will lead – with high certainty – to continuing decline in the local and global diversity of some taxa, especially vascular plants. These losses will occur at the fastest rates in warm mixed forests, savannas, scrub, tropical forests and tropical woodlands. Land use changes causing habitat loss are associated primarily with further expansion of agriculture and, secondarily, with the expansion of cities and infrastructure.

2. **Climate Change** - The MA emphasises that climate change in the past century has already had a measurable impact on biodiversity. Observed changes include changes in species distributions, population sizes, the timing of reproduction and migration events and an increase in the frequency of pest and disease outbreaks. The MA argues that by the end of the century, climate change and its attendant impacts (increased temperatures, changing precipitation patterns, sea level rise etc.) may be the dominant direct driver of biodiversity loss and changes in ecosystem services globally. According to the MA, the balance of scientific evidence suggests that there will be a significant net harmful impact on ecosystem services worldwide if global mean surface temperature increases more than 2^{o} Celsius above pre-industrial levels or at rates greater than 0.2^{o} Celsius per decade (medium certainty).

3. **Invasive Species** - According to the MA, invasive alien species have been a major cause of extinction, especially on islands and in freshwater habitats, and they continue to be a problem in many areas. In freshwater habitats, the introduction of alien species is the second leading cause of species extinction and on islands it is the main cause of extinction over the past 20 years.

4. **Over-exploitation** - For marine ecosystems, fishing has been the most important direct driver of change in the past 50 years. According to the MA, fishing constitutes the major direct anthropogenic force affecting the structure, function, and biodiversity of the oceans. Fishing pressure is such that, over much of the world, the biomass of fish targeted in fisheries (including those caught incidentally) has been reduced by 90% relative to levels preceding the onset of industrial fishing. Under the MA scenarios, demand for fish as food expands under all scenarios, and the result is predicted to be an increasing risk of major long-lasting collapse of regional marine fisheries. On land, trees and animals hunted for meat are also threatened by over-exploitation. Although the true extent of bushmeat over-exploitation is poorly understood, it is clearly a serious problem in tropical forests. The trade in wild plants and animals and their derivatives is poorly documented but is estimated in the MA a nearly (USD)160 billion annually.

5. **Pollution** - The MA anticipates that pollution, especially the deposition of nitrogen and phosphorus, but also including the impact of other contaminants, is expected to have an increasing impact, leading to declining biodiversity across biomes. The MA emphasises that over the past four decades, nutrient loading has emerged as one of the most important drivers of ecosystem change in terrestrial, freshwater, and coastal ecosystems. It is well established that the increased discharge of nutrients – particularly resulting from the application of fertilisers - causes intensive eutrophication. Under the MA scenarios, nitrogen deposition is anticipated to be the third most important driver of change for terrestrial ecosystems behind habitat transformation and climate change.

Considerations:

- Is the G200 the most appropriate biodiversity designation for the commodity being assessed i.e. WWF G200 vs. Conservation International Biodiversity Hotspots vs. BirdLife International?

Outputs

- Database including surface areas, correlating countries and calculations of the gross (total amount of sensitive area) and net (amount of sensitive area within the countries borders) area of sensitive areas located in, or partially in the countries selected.

2.6 Step 5: identify areas of commodity production

2.6.1 The next step, and key area of focus, is to establish the areas where the cultivation/extraction of these commodities takes place within the selected countries, and specifically within the sensitive areas in the country.

2.6.2 This step will necessitate establishing, through whatever information is available, the location and area of land under cultivation. There are various starting points for this. The FAO provides detailing figures on areas under harvest for certain commodities. This data is valuable as it has been kept over time and thus trends are able to be discovered. Additionally, the United States Department of Agriculture (USDA) has a sophisticated remote sensing department (PECAD) which provides information on intensity and location of commodity cultivation (a list of organisations and links has been provided in the Appendix). However, the information available is largely dependant on the commodity and country selected.

2.6.3 When identifying the areas of production, there are a series of points that should be kept in mind which will have a direct bearing on the usefulness of the data, these are:

1. Is the total area cultivated available?
2. Is this area displayed spatially?

3. Can the intensity of cultivation be determined?
4. Can the area attributable to UK consumption be calculated?
5. Are there other crops/commodities that may also be grown on this land (i.e. crop rotation)

Considerations:

- Is the area cultivated for different crops at different times of the year i.e. Brazil and soya and India and cotton?
- Is the data for growing *region* or *specific farms/sites*?
- Ideally, this information should be available as a GIS and thus easily incorporated into JNCC's database.
- Further analysis of the information may be needed to ascertain the proportions of the UK's consumption from these areas. Some assumptions of flows and proportions may be needed.

Outputs

- Quantification of area under cultivation
- Spatial overlay of areas under cultivation

2.7 Step 6: habitats, country, ecoregions and areas of production

2.7.1 With this information, we will where possible overlay, using GIS, the country, growing regions, and G200 ecoregions to show as clearly as possible the area under cultivation, the identified sensitive areas and any link between these areas and the UK. This may also be through the use of a database.

Considerations:

- Are the overlays digitised or processed in a way that may lead to errors?
- Are the spatial data available in a GIS?

Outputs

- Database illustrating the link between sensitive areas, areas under cultivation, commodities and countries.
- Indication of what proportion can be reasonably attributed to the UK.

[4] UNComtrade data from HS2002 classification. Available from: http://comtrade.un.org/db/mr/rfCommoditiesList.aspx
[5] WWF (2001) Available from: http://www.worldwildlife.org/science/ecoregions/g200.cfm

3 Confidence

3.1.1 It is important that policy makers and Government agencies know what level of confidence can be placed on the data and linkages. An ongoing assessment of confidence was carried out to determine this. Key questions being asked of the data were:

1. How direct is the link between the UK and source country (i.e. no staging countries or production countries)?
2. Is this country of UK or EU significance in terms of its proportion of their export market?
3. What are 'known unknowns'? Are there gaps in knowledge/ supply chain that are preventing us from making as informed a judgement as we would like to? Are the data we have relaiable?

3.1.2 In order to determine, with some consistency, which linkages have the highest confidence level, a matrix was used to score each commodity and country link. The completed matrix can be found in the accompanying database.

4 Brazil and Soya

4.1 Define commodity

4.1.1 In 2004[6], approximately 5,782,878,000 tonnes of soya beans were produced[7] and the global total area under cultivation was approximately 91,145,361ha. The cultivation and processing of soya beans yield three types of product:

- Whole soya beans (13% of total world crop)
- Soya oil (16% of total world crop)
- Soya meal (69% of total world crop)

4.1.2 In 2004, the main producers of soya beans were the USA (43% of world production8), Brazil (35% of world production), Argentina (11%) and Paraguay (4%). The main global importers of soya beans, were China (30% of world production), followed by the EU (19%) and then Japan (8%). The largest exporter of soya oil[9] was Brazil (18% of world production) followed by the EU, in particular the Netherlands and Germany. Key importers of soya oil include China (7.5% of global production), South Africa (7.5%), Belgium (7%) and India (5.9%). The main exporters of soya meal were the USA (63% of total exports) Europe (the Netherlands 10.5% and Belgium (8.3%), Bolivia(4.2%) and China (2.2%) and the largest importers were Spain (12.9% of the total) Australia (10.4%), Belgium (8.1%) and Mexico (6.9%).

4.1.3 In 2004, the UK imported 732,177.23 tonnes of soya beans which had a trade value of c. $238.5 billion. The UK also imported soya oil and soya meal. Imports of soya oil were 22,890.57 tonnes of soya oil worth $18,458,804 and imports of soya meal for soya beans was 6,904.77 tonnes worth $4,589,183.

4.1.4 The main exporters to the UK of:

- Soya beans are Brazil (80% of total imports), the USA (8.8%), Canada (3.9%) and Belgium (3.0%)
- Soya oil are The Netherlands (84% of total imports), Belgium (12%), Germany (6.2%) and France (5.8%)
- Soya meal are Belgium (35% of total imports), Ireland (20.4%) and the Netherlands (15.4%)

4.1.5 It should be noted that the Netherlands, Belgium, Germany and France are not cultivators of soya beans, rather they act as both staging countries and locations where processing occurs. These countries source most of their soya beans and products from Brazil, Argentina, Paraguay and Bolivia.

4.1.6 In terms of total exports of all commodities the export of soya beans and oil is not a key export from any of the countries identified. For example, soya bean exports represent 5% of all exports from Brazil. Of this 5%, the UK is the destination for 3% of Brazil's soya beans. Other, more significant, importers of soya beans from Brazil include China (30% of Brazil's soya beans exports), The Netherlands (18%), Germany (9.2%) and Spain (7.8%).

4.1.7 Due in part to restrictions in the area of new land suitable for soya in the US, this change is principally driven by rising global demand for traditional soya products, expected to increase by 60% by 2020 due to 'growing and increasingly affluent populations'[10]. In addition to Brazil and Argentina, Bolivia and Paraguay will likely show significant increases in their areas under soya production. Increasing global interest in bio-fuels could encourage soya production yet further in the future. Significant barriers to entry to the soya industry exist owing to the sector dominance of large multinationals such as Archer Daniels Midlands (ADM), Bunge, Cargill and Louis Dreyfus. Ownership of crops is similarly controlled either by large multinationals or other large companies. Key nodes which could be influenced include producers, governments, buyers, investors and regulators.

4.1.8 Soya bean trading in Brazil is largely controlled by a small number of international companies which operate on a large scale[11]. There are: Cargill (United States); Bunge (United States); Archer Daniels Midland (ADM) (United States); André et Cie (Switzerland); and Louis Dreyfus (France). Producers generally either trade directly with these companies or will deliver to intermediate traders, who in turn, deliver to the international traders.

4.2 Commodity Conditions

4.2.1 Cultivation is successful in climates with hot summers, with optimum growing conditions in mean temperatures of 20 °C to 30 °C (68°F to 86°F). They can grow in a wide range of soils, with optimum growth in moist alluvial soils with a good organic content. Historically they have been cultivated in Asia (and are native to the area). However more recenlty, the United States, Brazil and Agrentina have taken the lead in global soya production. Tha map below provides a illustration of those areas that without irrigation (i.e. rain reliant) are the optimum areas for soya growth.

4.3 Country Prioritisation

4.3.1 Country prioritisation in this case is based on two main criteria; status as an SDD country, and its importance to the UK as a trade partner for a specific commodity. Table 4.1 to 4.3 below provide information on the UK's top import partners, and the global quantities attributable to the UK. From this we can see that Brazil, a SDD country comes out as the largest import partner to the UK for soya beans, highest non-OECD and non-EEA country for soya bean oil, but not at all in the top ten for soya meal.

4.3.2 In 2005, the UK imported the following quantities from the world:

Table 4.1: Soya beans, whether or not broken[12].

Rank	Partner	Commodity	Trade Value (USD)	NetWeight (tonnes)
	World	Soya beans, whether or not broken.	230,881,776	774,622
1	Brazil	Soya beans, whether or not broken.	144,618,415	520,813
2	Malaysia	Soya beans, whether or not broken.	26,896,777	92,516
3	USA	Soya beans, whether or not broken.	22,439,315	83,832
4	Canada	Soya beans, whether or not broken.	10,917,217	42,332
5	Ireland	Soya beans, whether or not broken.	2,443,684	10,601
6	Italy	Soya beans, whether or not broken.	3,648,882	8,199
7	Belgium	Soya beans, whether or not broken.	7,195,255	7,741
8	Netherlands	Soya beans, whether or not broken.	10,609,008	4,820
9	China	Soya beans, whether or not broken.	1,244,178	2,453
10	Argentina	Soya beans, whether or not broken.	536,387	1,153

Table 4.2: Flours & meals of soya beans[13]

Rank	Partner	Commodity	Trade Value (USD)	NetWeight (tonnes)
	World	Flours & meals of soya beans	6,856,549	23,886
1	Ireland	Flours & meals of soya beans	3,923,294	16,759
2	Belgium	Flours & meals of soya beans	1,222,669	3,300
3	Netherlands	Flours & meals of soya beans	680,314	2,794
4	Italy	Flours & meals of soya beans	286,030	592
5	Denmark	Flours & meals of soya beans	65,194	160
6	USA	Flours & meals of soya beans	394,169	137
7	Canada	Flours & meals of soya beans	100,716	57
8	Austria	Flours & meals of soya beans	50,907	56
9	Israel	Flours & meals of soya beans	104,448	12
10	Serbia and Montenegro	Flours & meals of soya beans	4,707	5

Table 4.3: Soya-bean oil and its fractions[14]

Rank	Partner	Commodity	Trade Value (USD)	NetWeight (tonnes)
	World	Soya-bean oil and its fractions	103,460,144	144,914
1	Netherlands	Soya-bean oil and its fractions	65,205,881	85,276
2	Belgium	Soya-bean oil and its fractions	15,480,708	24,408
3	Brazil	Soya-bean oil and its fractions	14,649,790	24,209
4	France	Soya-bean oil and its fractions	5,280,223	8,619
5	Argentina	Soya-bean oil and its fractions	725,026	1,053
6	Germany	Soya-bean oil and its fractions	1,466,150	855
7	Italy	Soya-bean oil and its fractions	224,425	222
8	Ireland	Soya-bean oil and its fractions	52,531	78
9	Norway	Soya-bean oil and its fractions	46,207	73
10	Portugal	Soya-bean oil and its fractions	201,350	66

4.3.3 Table 4.4 provides an indication of the UK's significance in regard to the Brazilian export market for soya. The highest proportion that the UK makes up is 3% of the total exports of soya beans from Brazil. It can be assumed therefore that in terms of the economic leverage the UK may have over Brazil, it is insignificant (for instance, China is responsible for importing >30% of Brazil's soya bean output)

Table 4.4: UK Soya exports relative importance to Brazil's soya markets[15]

Commodity	Trade Value (USD)	Net Weight (tones)	Estimated Proportion of UK market
Flours & meals of soya beans	211	N/A	0.03%
Soya beans, whether or not broken.	153,009,366	461,822	3
Soya-bean oil and its fractions	8,276,375	13,170	0.65%

4.4 Identification of Ecoregions

4.4.1 The ecoregions for Brazil are easily identified through the WWF global ecoregions project. However, of more interest are the G200 ecoregions that have been identified as particularly valuable in regard to biodiversity. The table below presents the ecoregion present in Brazil, including terrestrial, freshwater and marine.

Box 2: Staging Countries
Major cargo ports such as Rotterdam in the Netherlands act as 'staging areas' where shipments of commodities arrive, are sorted and then re-exported to final destination countries. The commodity is then re-exported to other import partners. Crucially this is recorded by the reporter in some cases as imported from the staging country rather than the country of origin (hence why the Netherlands comes quite highly in the import partners, but it is not itself a cultivator of soya).

Table 4.5: G200 ecoregion present in Brazil[16]

Terrestrial G200_REGIO
Amazon-Orinoco-Southern Caribbean Mangroves[17]
Amazon River and Flooded Forests
Atlantic Dry Forests
Atlantic Forests
Cerrado Woodlands and Savannas
Chiquitano Dry Forests
Guianan Highlands Moist Forests
Guianan Moist Forests
Pantanal Flooded Savannas
Rio Negro-Juruß Moist Forests
Southwestern Amazonian Moist Forests
Fresh water G200_REGIO
Amazon River & Flooded Forests
Brazilian Shield Amazonian Rivers & Streams
Guianan Freshwater
Orinoco River & Flooded Forests
Upper Amazon Rivers & Streams
Upper Parana Rivers & Streams
Marine G200_REGIO
Northeast Brazil Shelf Marine
Patagonian Southwest Atlantic

4.5 Threats to these ecoregions[18]

Amazon-Orinoco-Southern Caribbean Mangroves[19]

4.5.1 Within the Guianas the main threats to this ecoregion are the removal of mangroves, over-hunting of turtles, birds and other mammals, the incidental catch of turtles by shrimp trawlers and fisheries activities, poaching of turtle eggs, over-fishing, increasing pesticide and fertilizer use from expanding rice fields, bauxite mining operations, and land clearing for livestock. In addition to the known threats, there is the possibility that other industries, such as sand mining, goldmining, and oil development may also be damaging the biodiversity of this ecoregion. The underlying reasons for these threats include poverty and the dependency of local communities on the natural resources of the coast. Lack of capacity within the governments to enforce regulations and implement management plans is also a problem as well as lack of awareness within the region.

Amazon River and Flooded Forests

4.5.2 In the flooded forests, selective logging of the kapok tree and virola is accelerating deforestation and wiping out populations of the above species over large regions. The open floodplains are threatened by conversion to cattle ranching and the widespread introduction of water buffalo, which are not native to the region and which cause damage to the shoreline vegetation and fish nursery areas. Overfishing, particularly of the largest species, is leading to declines in fish populations. Mercury pollution from gold mining in smaller streams may have long-term impacts. Because human population is increasing along the main rivers, untreated sewage is a growing problem. Roads built through the region open up access to previously remote areas and lead to erosion and increased use of the natural resources. Some dams exist already in the river basin and others are planned. These have the potential to block species movements and alter the flow of water.

Atlantic Dry Forests

4.5.3 Logging and conversion of forest for agriculture constitute the greatest threats to this region. Dry forests are even more threatened than rain forests.

Atlantic Forests

4.5.4 Major habitat threats include urbanization, industrialization, logging, agricultural expansion, and road building. And some species are further threatened by hunting and the wildlife trade.

Cerrado Woodlands and Savannas

4.5.5 The major threats to this ecoregion include agricultural expansion (which may include frequent burning), charcoal production, and water projects. Cattle grazing, which destroys native grassland habitats, is also a threat.

Chiquitano Dry Forests

4.5.6 Significant threats include pollution, road and pipeline development, wildlife exploitation, agricultural expansion, burning, and grazing.

Guianan Highlands Moist Forests

4.5.7 Extensive mining and associated mercury pollution are serious threats in some parts of this ecoregion, as are dams and planned commercial logging. Heavy poaching of wildlife is also a problem in some areas, while high-impact tourism threatens other locales.

Guianan Moist Forests

4.5.8 This ecoregion is threatened by expanding logging operations. Road-building is opening this "new frontier" to settlement and to continued logging and hunting pressures. Gold-mining and its resulting pollution also pose threats.

Pantanal Flooded Savannas

4.5.9 Agricultural expansion, charcoal production, water projects, gold mining, gas pipelines, mercury pollution, overfishing, uncontrolled nature tourism, and road construction pose severe threats to the Pantanal region.

Rio Negro-Juruß Moist Forests

4.5.10 Deforestation, overfishing, conversion of the land to agriculture, and colonization, largely brought on by road construction, pose the greatest threats to this remote region.

Southwestern Amazonian Moist Forests

4.5.11 Though once sparsely populated, this region is now home to growing numbers of people. Road building, mining, logging, hunting and collecting of wildlife, introduction of exotic species, mercury pollution, hydroelectric projects, and deforestation related to agriculture and ranching all threaten to degrade and fragment the vast forests.

4.6 Freshwater G200

Brazilian Shield Amazonian Rivers & Streams

4.6.1 This ecoregion comprises the most altered part of the Amazon basin. Threats include petroleum and mineral exploration, logging, construction of dams, agricultural expansion, pasture development, and overexploitation of aquatic species.

Guianan Freshwater

4.6.2 The freshwater habitats of this ecoregion are relatively intact and support generally stable freshwater populations. However, valuable game species such as the enormous

arapaima and some reptiles are imperiled as a result of over-exploitation and illegal border trade.

4.6.3 Further human activities such as deforestation, mining, agriculture, industrial and domestic waste discharge, and water extraction have led to serious problems such as erosion, sedimentation, cyanide spills, altered hydrologic regimes, pollution, and wildfires.

Orinoco River & Flooded Forests

4.6.4 Threats include pollution, siltation from mining and deforestation, conversion for agriculture, livestock grazing, intensive logging, and hunting of sensitive larger vertebrates. Large dams and water diversions are planned for several major tributaries, and these would destroy the hydrologic processes that support this ecoregion's aquatic fauna.

Upper Amazon Rivers and Streams

4.6.5 Hydroelectric dams, deforestation of headwater catchments for logging, and conversion to agriculture and pasture is a potentially serious problem leading to erosion and altered hydrologic regimes, further disturbing the movements of migratory fish species.

Other serious threats include oil development, pipelines, mining activities, and construction of roads and railroads that open up access to the region and increase levels of hunting and fishing. Habitat protection is severely hampered in the northwest portion of the basin where illegal narcotics activities predominate.

Upper Paraná Rivers & Streams

4.6.6 Impoundments, water diversions, hidrovias, and agriculture are among the biggest threats in this ecoregion. The Itaipu hydroelectric dam, with a massive generating capacity of over 12,000 megawatt, was built in 1979 on the Iguazu River. Its construction flooded approximately 100,000 hectares of land, and destroyed important aquatic habitats, including Guaíra Falls.

4.6.7 A number of additional dams and waterways are planned within the ecoregion that have the potential to effectively block fish migrations. Burning of land for soybean plantations, desertification of the land, agricultural pesticides, and untreated domestic sewage have affected the quality of water as well.

4.6.8 An oil spill of one million gallons on the Iguazu River in July 2000 highlighted the risks associated with oil development and transportation in the ecoregion. Introduced species, over fishing, and poaching pose further threats to this ecoregion's highly endemic fauna.

4.7 Marine G200

Northeast Brazil Shelf Marine

4.7.1 Overfishing, destructive fishing practices, and development threaten the reefs across this ecoregion. Recreational activities and tourism further damage the integrity of the reef ecosystem.

Patagonian Southwest Atlantic

4.7.2 Fisheries in the Southwest Atlantic have dramatically decreased in the last decade, due to increased fishing activities and bycatch with the management and control of fisheries linked more to political interests than to proper technical management of the marine resources.

4.7.3 The Patagonian region supports intense oil activities and ecosystems have suffered from major oil spills as well as release of contaminated ballast water, particularly affecting species such as penguins during their migratory movements along the coast.

4.7.4 In the vicinity of cities, sewage, industrial and harbour pollution are other causes for concern. Tourism is increasing in this area and with almost no coastal development or management plan in place, it could pose a threat to local wildlife, particularly to southern right whales during their breeding and calving activities.

4.8 Area of commodity production

4.8.1 In order to try and follow back UK soya bean imports back to a specific geographical area, we need to know A) the area under cultivation for UK consumption and B) the location of this area in regard to the country and to ecoregions and G200 ecoregions.

4.8.2 The total land area under cultivation for soya beans in Brazil was 22,895,300 ha in 2005. This is the end point in an accelerating growth trend starting in the 1960s. Note that this figure does not necessarily correlate with habitat transformation due to soya cultivation. Figure 4.1 shows the relationship between area and amount of soya harvested in Brazil.

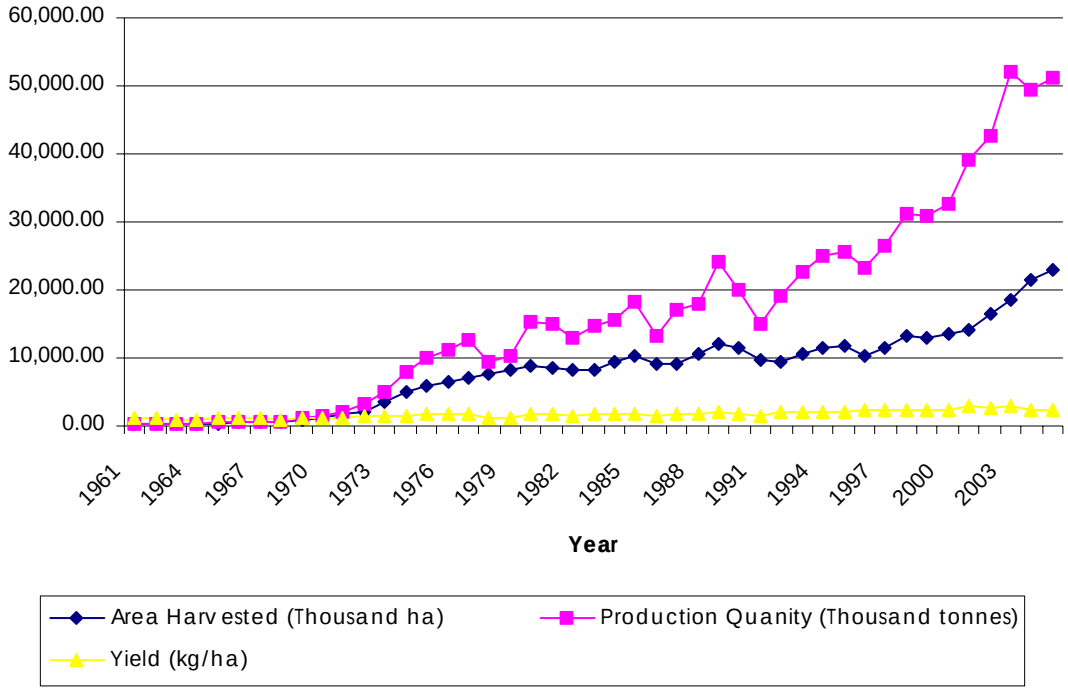


Figure 4.1: Land area cultivated for soya beans in Brazil[20].

4.9 Linking the data

4.9.1 If we take the entire information gather above, a number of links can be made. Table 4.6 illustrates the level of data that has been obtained.

Table 4.6: Ecoregion linkages for Brazil and soya

Ecoregion	Ecoregion threat[21]	Net G200 ecoregion area in country (km²)	Area of G200 ecoregion under cultivation (km²)	Proportion of net G200 ecoregion area under cultivation	UK Attributable area (km²)
Atlantic Dry Forests	1, 4	115101	1691	1%	67.64
Atlantic Forests	1, 4	1103287	334391	30%	13375.64
Cerrado Woodlands and Savannas	1	1901735	750388	39%	30015.52
Chiquitano Dry Forests	1, 5	65079	8259	13%	330.36
Pantanal Flooded Savannas	1, 5	135875	2978	2%	119.12
Southwestern Amazonian Moist Forests	1, 3, 5	1398226	9947	1%	397.88
Brazilian Shield Amazonian Rivers & Streams	1, 4	2181528	330162	15%	13206.48
Upper Parana Rivers & Streams	1, 5, 4	852061	496025	58%	19841

4.9.2 It is apparent from the table above that there are certain G200 ecoregions that are under greater pressure from soya cultivation than others (the ecoregions that have been determined to have no cultivation taking place in them have been excluded from this table but can be found in Volume II).

4.9.3 The area attributed to the UK has been calculated using the proportion of soya reported exported to the UK from Brazil (approximately four percent). A proportional approach may provide a degree of attribution, however, it is by no means foolproof. The areas located to the UK may very well be wholly outside a sensitive area, or wholly within, there is no way to determine this relationship at this stage.

4.10 Confidence

4.10.1 Volume II provides a more detailed split on the confidence ratings fro this pilot, however there are some points that should be mentioned.

4.10.2 The nature of the method of cultivation needs to be considered. Particularly the nature of shifting cultivation from wheat to rice to soya etc. The implications of this is that an area harvested may only be temporary and so there may be a time component needed in order to understand the significance of the link.

4.10.3 Staging countries play an important role. With the UK being one of the few countries that does not record its imports from the source country, it is difficult to truly understand the amounts of soya imported to the UK.

4.10.4 The nature of the soya imports also plays a role. Soya oil, meal, flour and beans all come from the same field, as such the relationship between the area calculated attributable to the UK can be called into question and a national hectare calculation, integrating double counting and concentration factors could be used.

4.11 So what does this tell us?

4.11.1 What we can confidently say through using this method is that some ecoregions are under more pressure from cultivation than others, for instance the Upper Parana Rivers & Streams being under 58 percent coverage for soya cultivation. As important as what this method tells us is what it doesn't. For instance, we can't say whether or not the UK soya imports come from this ecoregion or from another where the impact in terms of area under cultivation is not as significant.

4.12 Links and further information

- Central Intelligence Agency:
  - https://www.cia.gov/cia/publications/factbook/
- Food and Agriculture Organisation of the United Nations

- http://faostat.fao.org/
- United Nations Commodity Trade Statistics Database
  - http://UNComtrade.un.org/
- United States Department of Agriculture
  - http://www.usda.gov/wps/portal/usdahome

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[6] All dates are for 2004 data unless otherwise stated
[7] For all countries listed in FAO data available via: FAO STAT accessible via http://faostat.fao.org/site/336/default.aspx (accessed 06/09/06)
[8] Source of data: http://unstats.un.org/unsd/comtrade/ce/ceSnapshot.aspx?gt=ss&cc=2222&px=S3&y=2004(accessed 06/09/06)
[9] Data for soya oil is based on refined figures, for crude soya oil imports and exports see Comtrade
[10] WWF (2004) *Soy boom: doom or boon for South America's forests and savannah*. Available from: http://www.wwf.org.uk/news/scotland/n_0000001332.asp
[11] Ibid
[12] Source UNComtrade (HS2002 Classification for 2005)
[13] Source UNComtrade (HS2002 Classification for 2005)
[14] Source UNComtrade (HS2002 Classification for 2005)
[15] Source UNComtrade (HS2002 Classification for 2005)
[16] WWF Global Ecoregions (2001). Available from: http://www.worldwildlife.org/science/ecoregions/g200.cfm
[17]WWF. Available from: http://www.wwfguianas.org/ecoregions/ecoregions_mangroves.html
[18] Note that a correlation of the Millennium Ecosystem Assessment drivers of biodiversity and the threats identified here can be found in the database.
[19] WWF. Available from: http://www.wwfguianas.org/ecoregions/ecoregions_mangroves.html
[20] FAO. Available from: http://faostat.fao.org/site/567/default.aspx
[21] Ecoregion threats based on: 1)Habitat Change , 2)Climate Change, 3)Invasive Species 4)Over-exploitation 5)Pollution

5 Brazil and Lumber

5.1 Define commodity

5.1.1 Lumber is the name used, generally in North America, for wood that has been cut into boards, planks, or other shapes for the purpose of woodworking or construction.

5.1.2 Forest products including lumber represent major UK commodity imports with potentially significant environmental and social impacts depending on the location from which they are sourced and the manner of their production. According to UNComtrade, the UK directly imports relatively little ***non-coniferous*** lumber from Brazil - (USD)6m in 2005 (vs. (USD)98m from the USA). Imports from Brazil are also significantly less than Malaysia ((USD)45m), Cameroon ((USD)28m) and Indonesia ((USD)21m) – other countries with significant areas of tropical forest. It should be noted that the UK also imports ***coniferous*** lumber from Brazil albeit only (USD)3m (half the value of non-coniferous lumber imports). Brazil also has a very large and growing pulp and paper industry, the principal input to which is eucalyptus and to a lesser degree pine, both of which are grown in plantations. The pine plantations provide for the export of coniferous lumber. Industry sources claim that eucalyptus and pine plantations have mostly been established on land that was formerly used for agriculture or pasture land and on some native grassland.

5.1.3 It should also be noted that according to a recent WWF report, the UK is the world's third largest importer of illegally harvested or traded timber and wood products and Europe's largest[22]. However, the majority of this originates within Russia or the EU; the tropical countries of Brazil, Indonesia, Malaysia and central and west Africa account for only around 370,000 cubic metres (out of a total of around 3,265,469 cubic metres). Moreover, Brazil itself accounts for only around 15,858m^3.

5.2 Commodity Conditions

Tropical timber

5.2.1 Tropical forests cover 57% of Brazil, a total area of 4,776,980 km^2. Of this, around 87% remains in a primary state, 12% in a semi-natural state and slightly more than 1% is contained in plantations.

5.2.2 Tropical rainforests are located in a band around the equator, mostly in the area between the Tropic of Cancer (23.5° N latitude) and the Tropic of Capricorn (23.5° S latitude). This 3,000 mile (4800 km) wide band is called the "tropics."

5.2.3 The temperature in a rain forest rarely gets higher than 93 °F (34 °C) or drops below 68 °F (20 °C); average humidity is between 77 and 88%; rainfall is often more than 100 inches a year. There is usually a brief season of less rain.

Coniferous plantation

5.2.4 Comprising the largest share of the Amazon forest, the largest remaining tropical forest biome, Brazil also holds the majority of the rapidly dwindling Atlantic Forest which is home to the majority of productive tree plantations[23]. Brazil has five million hectares in plantations, of which 95% are exotic eucalyptus and pines[24].

5.2.5 A somewhat dated article by Barclay (1997) states that *"While the natural forest of Brazil covers nearly 400 million hectares, two-thirds of which is in the Amazon, the dynamic part of the forest industry is based on five million hectares of plantation forest, located in southern Brazil bordering the Atlantic Coast"*[25].

Figure 5.1: Conservation International Biodiversity Hotspot

5.2.6 According to Conservation International, the Atlantic Forest of tropical South America boasts 20,000 plant species, 40 percent of which are endemic. Yet, less than 10 percent of the forest remains. According to Conservation International, much of Brazil's industrial forestry operations are located in the states of Bahia, Minas Gerais and Espírito Santo in the heart of the Atlantic Forest Hotspot. Plantations are typically monospecific stands of eucalyptus. However, it should be noted that Eucalyptus plantations are primarily located on abandoned agricultural lands, deforestation having occurred earlier[26].

5.3 Country Prioritisation

5.3.1 Country prioritisation is based on two main criteria, its selection as an SDD country, and its importance to the UK as a trade partner for a specific commodity. Table 5.1 below provides information on the UK's top import partners, and the global quantities attributable to the UK. From this we can see that Brazil, an SDD country comes out as the

19th biggest import partner to the UK for non-coniferous lumber and the 21st for coniferous lumber.

Table 5.1: Top import partners of non-coniferous lumber to the UK [27]

Partner	Trade Value (USD)	Net Weight (tonnes)
USA	$98,155,926	74,224
China	$63,672,864	34,774
Malaysia	$45,001,201	37,959
France	$43,792,147	32,398
Italy	$37,999,718	12,142
Germany	$36,730,907	33,126
Canada	$32,119,434	18,585
Latvia	$30,418,377	105,914
Cameroon	$28,310,695	32,431
Netherlands	$24,787,068	77,496
Indonesia	$21,047,707	14,092
Côte d'Ivoire	$16,171,551	12,882
Belgium	$12,702,392	10,461
Ghana	$10,766,556	7,818
Estonia	$10,094,466	35,815
Austria	$7,632,253	8,437
Poland	$7,283,235	4,191
Sweden	$6,402,488	9,600
Brazil	$6,397,493	8,024

Table 5.2: Top import partners of coniferous lumber to the UK [28]

Partner	Trade Value (USD)	Net Weight (tonnes)
Sweden	$634,217,098	1,391,674
Finland	$309,286,701	648,924
Latvia	$282,724,926	782,229
Russian Federation	$150,968,805	497,783
Estonia	$61,777,473	181,685
Ireland	$53,964,002	114,587
Germany	$53,564,197	135,670
Canada	$48,054,698	39,639

Lithuania	$38,366,321	120,583
USA	$24,464,454	19,759
Czech Rep.	$20,567,419	52,726
Austria	$14,904,199	40,040
Norway	$11,449,986	27,341
Chile	$9,371,987	31,077
Netherlands	$7,255,936	10,549
Belgium	$7,252,572	17,813
Denmark	$6,894,404	6,603
France	$6,884,033	7,954
Belarus	$6,838,213	20,000
China	$3,939,288	2,073
Brazil	$3,349,865	2,067

5.4 Identification of Ecoregions

5.4.1 The ecoregions for Brazil are readily identified through the WWF global ecoregions project. However, of more interest are the G200 ecoregions that have been identified as particularly valuable in regard to biodiversity. Table 5.3 provides the area for each ecoregion in km².

Table 5.3: Freshwater and terrestrial G200 Ecoregions in Brazil

Terrestrial G200	**Gross Area (km²)**	**Net area in country (km²)**
Amazon-Orinoco-Southern Caribbean Mangroves	19502.74	12250.30
Amazon River and Flooded Forests	469887.89	408276.55
Atlantic Dry Forests	115101.94	115101.94
Atlantic Forests	1223445.07	1103287.90
Cerrado Woodlands and Savannas	1915011.82	1901735.73
Chiquitano Dry Forests	230530.76	65079.46
Guianan Highlands Moist Forests	424143.82	117246.59
Guianan Moist Forests	513864.28	68947.63
Pantanal Flooded Savannas	166008.78	135875.02
Rio Negro-Jurua Moist Forests	823295.94	332118.62
Southwestern Amazonian Moist Forests	1885496.74	1398226.34
Freshwater G200	**Gross Area (km²)**	**Net area in country (km²)**

Amazon River & Flooded Forests	839855.06	777904.495
Brazilian Shield Amazonian Rivers & Streams	2497688.43	2181528.479
Guianan Freshwater	511083.96	16838.3309
Orinoco River & Flooded Forests	983194.76	1209.193974
Upper Amazon Rivers & Streams	3409735.23	1467019.576
Upper Parana Rivers & Streams	905873.24	852061.501

5.5 Threats to these ecoregions

Amazon-Orinoco-Southern Caribbean Mangroves

5.5.1 Threats include pollution, siltation from mining and deforestation, conversion for agriculture, livestock grazing, intensive logging, and hunting of sensitive larger vertebrates. Large dams and water diversions are planned for several major tributaries, and these would destroy the hydrologic processes that support this ecoregion's aquatic fauna.

Amazon River and Flooded Forests

5.5.2 In the flooded forests, selective logging of the kapok tree and virola is accelerating deforestation and wiping out populations of the above species over large regions. Open floodplains are being converted for cattle ranching, which can include introduced water buffalo (*Bubalus bubalis*). Other threats include: overfishing - particularly of the largest species; mercury pollution from gold mining in smaller streams; increasing population centres and the resultant untreated sewage; construction of roads and dams that have the potential to block species movements and alter hydrology.

Atlantic Dry Forests

5.5.3 Logging and conversion to agriculture are among the chief threats present in this ecoregion.

Atlantic Forests

5.5.4 Two of the world's largest cities - Rio de Janeiro and Sao Paulo, lie within the Atlantic Forests ecoregion, indicating the challenge of conserving the remaining habitat in the area. In a recent study, just 2.5 acres (one hectare) of the forest were found to have 450 different species of trees. Protecting this diversity while meeting the needs of growing metropolitan and rural populations is a serious challenge. Urbanisation, industrialisation, logging, agricultural expansion, and associated road building threaten this globally important region of biological diversity. Habitat loss, hunting, and the wildlife trade threaten many species. Given the high levels of local richness and endemism and the extensive loss of natural habitat, over 95% in many areas, the probability of species extinctions is high without intensive conservation efforts. Relatively extensive, but

generally unprotected blocks of forest remain in the southern portion of the ecoregion, particularly in Argentina and Paraguay.

Cerrado Woodlands and Savannas

5.5.5 Agricultural expansion (including frequent burning and charcoal production), degradation as a result of development, and water projects pose major threats to the Cerrado. Grazing of cattle, which destroys native grassland habitats, is also problematic.

Chiquitano Dry Forests

5.5.6 Significant threats include pollution, road and pipeline development, wildlife exploitation, agricultural expansion, burning, and grazing.

Guianan Highlands Moist Forests

5.5.7 Extensive mining, mercury pollution, dams, heavy poaching, commercial exploitation of wildlife, and planned commercial logging are serious threats in some portions of the ecoregion. Plus, high-impact tourism is a serious problem in other localities.

Pantanal Flooded Savannas

5.5.8 Agricultural expansion, charcoal production, water projects, pollution, gold mining, mercury pollution, over fishing, uncontrolled nature tourism, and road construction pose severe threats to the Pantanal.

Rio Negro-Jurua Moist Forests

5.5.9 Deforestation, over fishing, agricultural conversion, colonisation, and road construction pose significant threats.

Southwestern Amazonian Moist Forests

5.5.10 Deforestation related to agriculture and ranching, mining, road building, logging, wildlife exploitation, introduction of exotic species, mercury pollution, and hydroelectric projects are the major threats facing this region.

Brazilian Shield Amazonian Rivers & Streams

5.5.11 This ecoregion comprises the most altered part of the Amazon basin. Threats include petroleum and mineral exploration, logging, construction of dams, agricultural expansion, pasture development, and overexploitation of aquatic species.

Guianan Freshwater

5.5.12 The freshwater habitats of this ecoregion are relatively intact and support generally stable freshwater populations. However, valuable game species such as the enormous arapaima and some reptiles are imperiled as a result of over-exploitation and illegal

border trade. Further human activities such as deforestation, mining, agriculture, industrial and domestic waste discharge, and water extraction have led to serious problems such as erosion, sedimentation, cyanide spills, altered hydrologic regimes, pollution, and wildfires.

Orinoco River & Flooded Forests

5.5.13 Threats include pollution, siltation from mining and deforestation, conversion for agriculture, livestock grazing, intensive logging, and hunting of sensitive larger vertebrates. Large dams and water diversions are planned for several major tributaries, and these would destroy the hydrologic processes that support this ecoregion's aquatic fauna.

Upper Amazon Rivers & Streams

5.5.14 Hydroelectric dams, deforestation of headwater catchments for logging, and conversion to agriculture and pasture is a potentially serious problem leading to erosion and altered hydrologic regimes, further disturbing the movements of migratory fish species. Other serious threats include oil development, pipelines, mining activities, and construction of roads and railroads that open up access to the region and increase levels of hunting and fishing. Habitat protection is severely hampered in the northwest portion of the basin where illegal narcotics activities predominate.

Upper Parana Rivers & Streams

5.5.15 Impoundments, water diversions, hidrovias, and agriculture are among the biggest threats in this ecoregion. The Itaipu hydroelectric dam, with a massive generating capacity of over 12,000 megawatt, was built in 1979 on the Iguazu River. Its construction flooded approximately 100,000 hectares of land, and destroyed important aquatic habitats, including Guaíra Falls. A number of additional dams and waterways are planned within the ecoregion that have the potential to effectively block fish migrations. Burning of land for soybean plantations, desertification of the land, agricultural pesticides, and untreated domestic sewage have affected the quality of water as well. An oil spill of one million gallons on the Iguazu River in July 2000 highlighted the risks associated with oil development and transportation in the ecoregion. Introduced species, over fishing, and poaching pose further threats to this ecoregion's highly endemic fauna.

5.6 Area of commodity production

Tropical timber

5.6.1 Brazil's forests comprise the world's largest timber resource although Brazilian wood-based exports need not necessarily come from natural forests. Exports of tropical timber from Brazil are relatively small. As a 2003 report by IIED states, *"wood-based exports are to date embryonic in all but the Southern plantation-based pulp and paper industries"*[29].

According to the IIED report, total tropical timber exports as yet comprise only a small fraction of total production (14%) and while tropical hardwood exports began to accelerate from the 1990s with improved processing technologies they still only comprise a tiny percentage of total wood product exports. Much of Brazil's tropical timber is used internally. Brazil is the second largest producer of tropical logs (24.5 million m^3/yr) after Indonesia, but also the second largest consumer of tropical logs[30]. According to IIED, it is also the world's largest producer of tropical sawnwood (9.86 million m^3) and also the largest consumer of tropical sawnwood[31].

5.6.2 While Brazilian timber exports comprise a small percentage of total timber production, Brazil is still the second largest exporter of tropical sawnwood (900,000m^3) principally of high value species such as *Tabebuia spp.* and *Cedrela spp*., the fifth largest exporter of tropical veneer, and the third largest exporter of tropical plywood. Brazil is also a major exporter of tropical secondary wood products[32].

5.6.3 According to the International Tropical Timber Organisation (ITTO), vast areas of the Amazon are currently under no threat from deforestation or other significant human-induced disturbance due to their remoteness[33]. However, studies have identified different 'frontiers' of exploration and areas where logging is concentrated. The figure in Volume II indicates that timber extraction is concentrated in the eastern part of the Amazon with the western area relatively untouched. Extraction is concentrated particularly in the central northern part of Brazil.

5.6.4 In terms of plantations (rather than extraction from natural forests), according to IIED, the rate of plantation in Brazil is currently about 10 per cent of the rate of deforestation and most of the large areas of plantation have been established in the South of the country rather than the Amazon region[34].

Evergreen / coniferous timber

5.6.5 In 2000, there were 543,905,000 ha of forest out of Brazil's total land area of 845,651,000 ha in Brazil (i.e. forests cover 64.3% of Brazil's land mass - FAO, 2001). According to IIED, some 4,982,000 ha of that total consists of plantations mainly as monocultures of pine and eucalypt, almost exclusively in the South of Brazil[35]. According to Conservation International, much of Brazil's industrial forestry operations are located in the states of Bahia, Minas Gerais and Espírito Santo in the heart of the Atlantic Forest Hotspot. These states are shown in Volume 2. According to the ITTO, the Amazon represents the single largest tract of tropical rainforest and is still 86% intact; in contrast, the Atlantic forest covers less than 7% of its original area (although it still harbours a wide variety of biodiversity)[36].

5.7 Links and further information

- International Tropical Timber Organisation
  - http://www.itto.or.jp/live/index.jsp

- World Forestry Centre
  - http://wfi.worldforestrycenter.org/WF-braz.htm

[22] WWF (2007). *Illegal Logging: Cut it Out* . Available from: http://www.wwf.or.jp/activity/forest/lib/IllegalLoggingUK200701f.pdf
[23] May, P. H. (2004). *Forest Certification in Brazil*. Available from: http://www.yale.edu/forestcertification/symposium/pdfs/brazil_symposium.pdf
[24] FAO. 2000. "Global Forest Resource Assessment," . Available from: http://www.fao.org/forestry/fo/fra/index.jsp.
[25] Barclay, R. (1997). Brazil: Myth vs. Reality . Available from: http://www.forestnet.com/archives/Sept_97/brazil.html
[26] McNabb (1994). *Silvicultural Techniques for Short Rotation Eucalyptus Plantations in Brazil* . Available from: http://www.woodycrops.org/mechconf/mcnabb.html
[27] UNComtrade
[28] UNComtrade
[29] IIED (2003). *Growing Exports: The Brazilian Tropical Timber Industry and International Markets* . Available from: http://www.iied.org/pubs/pdf/full/13502IIED.pdf
[30] ITTO (2000) Annual review and assessment of the world timber situation. ITTO, Yokohama, Japan. 195pp.
[31] IIED (2003). *Growing Exports: The Brazilian Tropical Timber Industry and International Markets* . Available from: http://www.iied.org/pubs/pdf/full/13502IIED.pdf
[32] ITTO (2000) Annual review and assessment of the world timber situation. ITTO, Yokohama, Japan. 195pp
[33] Available from: http://www.itto.or.jp/live/PageDisplayHandler?pageId=272&sid=302
[34] IIED (2003). *Growing Exports: The Brazilian Tropical Timber Industry and International Markets* . Available from: http://www.iied.org/pubs/pdf/full/13502IIED.pdf
[35] *Ibid*
[36] Available from: http://www.itto.or.jp/live/PageDisplayHandler?pageId=272&sid=302

6 Columbia and Palm Oil

6.1.1 Palm oil, extracted from tropical oil palms, is the world's largest oil crop after soya. The variety *Tenera* (a hybrid of the African Oil Palm (*Elaeis guineensis*)), cultivated in nearly all the world's plantations, gives the highest yield of any oil or oil seed crop, and is the main source for vegetable oil for many tropical countries[37]. The oil palm is now grown as a plantation crop in most countries with high rainfall (minimum 1,600 mm/yr) in tropical climates within 10° of the equator[38].

6.2 Define commodity

6.2.1 Palm oil products include oil from the pulp of the fruit and from the kernel in either crude or a refined form, palm nuts and kernels and palm oil cake. UNComtrade data, SITC Rev 3, classifies palm oil into the following 6 categories:

1. Palm nuts and kernels
2. Palm oil, crude
3. Palm oil, refined, and its fractions
4. Palm kernel or babassu oil, crude
5. Palm kernel or babassu oil, refined, and fractions thereof
6. Oilcake and other solid residues of oil from palm nuts or kernel

6.3 Commodity Conditions

6.3.1 Cultivation of the oil palm is most successful in countries where the climate is humid and hot all the year round. The optimum temperature for palm cultivation is between 25 and 28°C. Oil Palm growth and productivity is greatest in warmer conditions, in cool conditions the oil palm is less productive and more susceptible to disease. The oil palm thrives in sunny and wet conditions requiring a plentiful supply of water; and grows best where the soil is flat, deep, permeable and rich in nutrients[39]. Figure 6.1 illustrates the areas globally that current are suitable for the cultivation of palm.

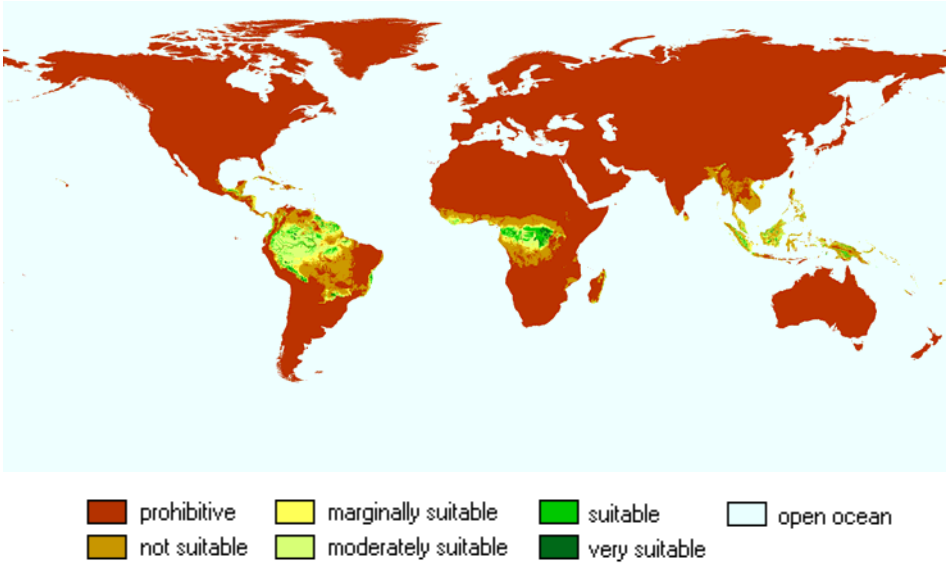


Figure 6.1: Crop Suitability for Rainfed Oil palm, High Input Level[40]

6.4 Country Prioritisation

6.4.1 Country prioritisation is based on two main criteria, its selection as an SDD country, and its importance to the UK as a trade partner for a specific commodity. Table 6.1 below provides information on the global quantities of palm and palm products imported to the UK. Table 6.2 provides information on the UK's top import partners.

6.4.2 In 2005, the UK imported approximately 4,785,440 tonnes of palm oil products from around the globe at the cost of approximately (USD)1bn. Crude palm nuts and kernels accounted for approximately 67% of palm oil product imports to the UK in 2005.

Table 6.1: UK Imports of Palm Oil Products[41]

Commodity	SITC Rev 3 Code	Total value of UK imports (USD)	Total net weight of UK imports (tonnes)
Palm nuts and kernels	2232	590,932,719	3,185,656
Palm oil, refined, and its fractions	4222	309,388,561	652,109
Palm kernel or babassu oil, crude	4224	43,732,984	64,854
Oilcake and other solid residues of oil from palm nuts or kernel	08138	82,390,696	882,822
Total palm oil products	-	1,026,444,960	4,785,442

6.4.3 Table 6.2 identifies the top five import partners with the UK for palm oil products in 2005; Malaysia, Indonesia, Papua New Guinea, Netherlands and Colombia. These import partners have been identified from aggregated data provided by UNComtrade, note that this data is in value rather than weight.

Table 6.2: The major import partners of palm oil products to the UK[42], [43]

Import Partner	Trade Value (USD) of Palm Product Imports to the UK
Malaysia	$118,560,035
Indonesia	$81,467,953
Papua New Guinea	$77,477,013
Netherlands	$52,948,981

Colombia	$49,154,784
Other partners	$62,682,023

6.4.4 Table 6.3 provides palm oil product export data for Colombia. It indicates that Colombia exports approximately 261,418 tonnes of palm oil products to countries around the globe, of which approximately 40.1% is exported to the UK. It should be noted that import data reported at the UK end of chain suggests that the UK imports of palm oil products from Colombia are marginally greater, in the region of 110,669 tonnes (see Table 6.4). Thus there is reasonable confidence with which it can be said that the UK accounts for a significant proportion of the Columbian palm oil market.

Table 6.3: Colombian exports of palm oil to the UK and globally (2005) [44]

Commodity	SITC Rev 3 Code	Net Weight of all Colombian palm product exports (tonnes)	Net Weight of Colombian palm product exports to the UK (tonnes)	Colombian palm oil exports to the UK as a % of the Net Weight of all Colombian palm exports
Palm nuts and kernels	2232	217	-	-
Palm oil, refined, and its fractions	4222	228,342	99,022	43.4
Palm kernel or babassu oil, crude	4224	32,858	5,676	17.3
Oilcake and other solid residues of oil from palm nuts or kernel	08138	-	-	-
Total palm oil products	-	261,418	104,698	40.1

6.4.5 In terms of supply of palm products to the UK, Colombia contributes a share of the UK's palm oil (refined and crude), supplying approximately a 16% and 8% share of UK imports respectively (see Table 6.4).

Table 6.4. The Colombian share of total UK imports of palm products (calculated by weight), 2005 [45]

Commodity	SITC Rev 3 Code	Total net weight of UK palm oil imports (tonnes)	Weight of UK palm oil imports from Colombia (tonnes)	Imports from Colombia to the UK as a % of total UK palm oil imports
Palm nuts and kernels	2232	3,185,656	-	-
Palm oil, refined, and its fractions	4222	652,109	105,433	16.2
Palm kernel or babassu oil, crude	4224	64,854	5,236	8.1
Oilcake and other solid residues of oil from palm nuts or kernel	08138	882,822	-	-
Total palm oil products	-	4,785,442	110,669	2.3

6.5 Identification of Ecoregions

6.5.1 The Ecoregions for Colombia are readily identified through the WWF global Ecoregions project. However, of more interest are the G200 Ecoregions that have been identified as

particularly valuable in regard to biodiversity. The figures in Volume II present the G200 Ecoregions present in Colombia, including terrestrial, freshwater and marine. Additionally, a table is provided giving the area for each ecoregion in km². Almost the entire area of Colombia falls within a G200 ecoregion.

Table 6.5: The Area of Ecoregions in Colombia

Ecoregion	Area (km²)
Terrestrial	
Guianan-Amazon (Amazon-Orinoco-Southern Caribbean) Mangroves	19503
Amazon River and Flooded Forests	469887
Chocó-Darién Moist Forests	186780
Guianan Highlands Moist Forests	424144
Llanos Savannas	376689
Napo Moist Forests	340740
Northern Andean Montane Forests	422828
Northern Andean Páramo	15757
Rio Negro-Juruá Moist Forests	823295
Panama Bight (South American Pacific) Mangroves	6290
Tumbesian-Andean Valleys Dry Forests	29251
Freshwater	
Amazon River and Flooded Forests	839855
Orinoco River & Flooded Forests	983195
Upper Amazon Rivers & Streams	3409735
Marine	
Panama Bight	**N/A**
Southern Caribbean Sea	**N/A**

6.6 Threats to these Ecoregions

Guianan-Amazon (Amazon-Orinoco-Southern Caribbean) Mangroves

6.6.1 A large number of chemical factories and oil refineries in the ecoregion cause pollution and harm the habitat. Agriculture causes large amounts of soil to erode from the land and wash into the mangroves, swamps, and marshes. Sometimes mangroves are cut down completely because of development along the shoreline or are logged for charcoal or timber.

Amazon River and Flooded Forests

6.6.2 In the flooded forests, selective logging of the kapok tree and virola is accelerating deforestation and wiping out populations of the above species over large regions. The open floodplains are threatened by conversion to cattle ranching and the widespread introduction of water buffalo, which are not native to the region and which cause damage to the shoreline vegetation and fish nursery areas. Overfishing, particularly of the largest species, is leading to declines in fish populations. Mercury pollution from gold mining in smaller streams may have long-term impacts. Because human population is increasing along the main rivers, untreated sewage is a growing problem. Roads built through the region open up access to previously remote areas and lead to erosion and increased use of the natural resources. Some dams exist already in the river basin and

others are planned. These have the potential to block species movements and alter the flow of water.

Chocó-Darién Moist Forests

6.6.3 Shifting cultivation and the spread of human settlements threaten to increase deforestation in certain parts of this ecoregion. Unsustainable logging practices, overhunting, and overcollecting of certain forest species are also concerns.

Guayanan Highlands Moist Forests

6.6.4 Extensive mining and associated mercury pollution are serious threats in some parts of this ecoregion, as are dams and planned commercial logging. Heavy poaching of wildlife is also a problem in some areas, while high-impact tourism threatens other locales.

Llanos Savannas

6.6.5 Livestock grazing, burning for new growth, draining of wetlands, conversion to agriculture, and overhunting are the greatest threats to the biodiversity of this ecoregion. Dickcissels, birds from the Great Plains, winter here and are endangered by pesticides.

Napo Moist Forests

6.6.6 New and planned roads are opening the Napo Moist Forests to degradation through colonization, agriculture, intensive hunting, oil exploration, and timber exploitation. Already many areas of the forest are seriously fragmented, and the threat of oil spills looms over vast regions of the Western Arc forests.

Northern Andean Montane Forests

6.6.7 A growing human population in this region has led to severe pressures on the forests. In seeking space for agriculture and gathering wood for fuel and timber, people have cleared large sections of the forest. Mining activities have also degraded significant stretches of the forest.

Northern Andean Paramo

6.6.8 Frequent burning, grazing, forest plantations, and the development of agriculture threaten Páramos in some areas.

Rio Negro-Juruá Moist Forests

6.6.9 Deforestation, overfishing, conversion of the land to agriculture, and colonization, largely brought on by road construction, pose the greatest threats to this remote region.

Panama Bight (South American Pacific) Mangroves

6.6.10 Clearing of mangroves for shrimp farms is the major threat to this ecoregion. Pollution and alteration of tidal flows are another problem.

Tumbesian-Andean Valleys Dry Forests

6.6.11 Logging, agricultural expansions, burning, and overgrazing all present severe threats to these forests.

Orinoco River and Flooded Forests

6.6.12 Many people move to the Orinoco Basin because of its fertile soil. They have cleared large areas of the flooded forests for agriculture and cattle ranching. Trees have also been cut down for timber. Large dams and water diversions are planned for several major tributaries, and these would destroy the water flows that support this ecoregion's aquatic animals. Pollution and siltation from mining and deforestation, as well as hunting of larger vertebrates, pose additional threats.

Upper Amazon Rivers and Streams

6.6.13 Deforestation within the headwater areas for timber and conversion to agriculture and pasture is a potentially serious problem, leading to soil flowing off the land and into the rivers and streams. Hydroelectric dams in this ecoregion also modify the natural flow of the rivers and streams and block the movements of migratory fish species. Oil drilling and transport through pipelines occur primarily in the Cordillera Oriental in the Andean portion of the Amazon, and mining activities are relatively widespread. Roads and railroads open up access to the region and increase levels of hunting and fishing. Habitat protection is severely hampered in the northwest portion of the basin, where illegal drug trade and related activities predominate.

Panama Bight

6.6.14 El Niño climate events have warmed the water of this ecoregion, which has led to bleached and killed coral. Outbreaks of the crown-of-thorns starfish also reduce coral populations. Deforestation on shore and destruction of the reefs due to fishing are general threats. Siltation from soil erosion has destroyed many coral areas. Other threats include mining, oil shipping, and pesticides.

Southern Caribbean Sea

6.6.15 The Southern Caribbean Sea is polluted by chemicals (such as mercury) from agriculture and industry and by untreated waste from growing coastal towns and tourist centers. Dredging and poor agricultural practices cause sedimentation. Eutrophication and anoxia have destroyed reefs and sea-grass beds. Many such ecosystems have also been destroyed by oil drilling and oil pollution. Chronic oil pollution from oil drilling in Barbados, Venezuela and Trinidad and Tobago has wiped out mangrove swamps, sea-grass

meadows, and coral reefs. Sea turtles and marine mammals are killed by ingesting floating tar from coastal development. Overfishing and the hunting of turtles for their meat and shells are two serious problems. Turtles are also killed when they drown in fishing nets.

6.7 Area of commodity production

6.7.1 The total land area under cultivation for Palm Nuts (Kernals) in Colombia was approximately 170,000ha[46] in 2005 according to the FAO[47]. The FAO holds data on the area of land harvested for Palm Nuts (Kernels) in Colombia, but does not hold data for the area of land harvested for palm oil, palm kernels or palm kernel oil although these are commodity categories within the FAOSTAT database.

6.7.2 Since it's introduction to Colombia in 1932, and it's subsequent commercial cultivation in the mid-1950s the total area of land cultivated had increased steadily since, with production rising from 90,000ha in 1990 to 135,000ha by 2000, see Figure 6.2 below[48]. Whilst this data is sourced from the UN's Food and Agricuilture Organisation (FAO), it is unclear as to what methods have been used. Potentially the methods of monitoring oil palm cultivation will have altered and in recent years aerial photography and GIS technology may have been employed. Note that this figure does not necessarily correlate with habitat transformation due to oil palm cultivation.

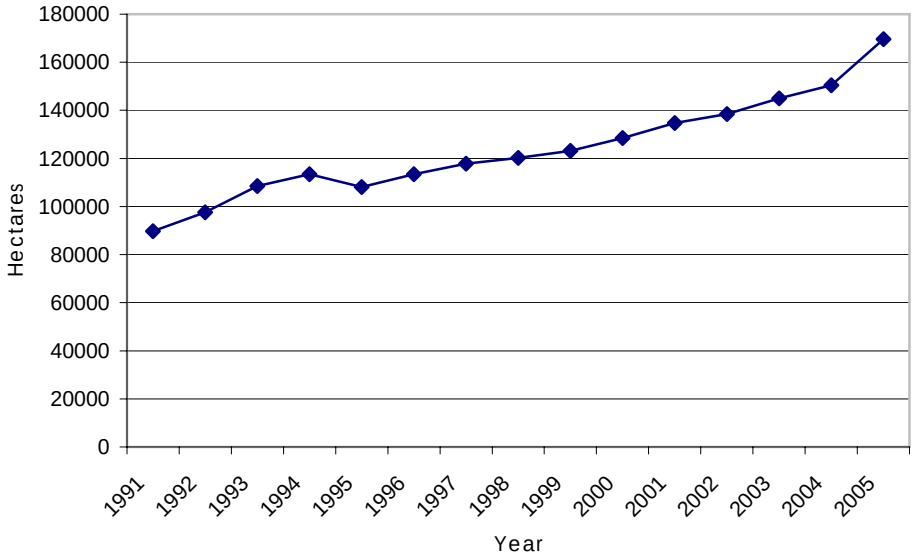


Figure 6.2: Area Harvested for Palm Oil in Colombia between 1991 and 2005[49]

6.8 Location of Commodity Production

Zones[50]

6.8.1 The location of palm oil production within Colombia has been identified from Fedepalma, the federation of palm oil producers in Colombia. The data upon which they base their statistics is not outlined in all cases and therefore the confidence in these statistics is difficult to establish. The information from Fedepalma is based on the four zones of Colombia: Northern, Central, Western and Eastern. The distribution of palm oil production areas according to these zones is shown in Figure 6.3 below (year of data unknown).

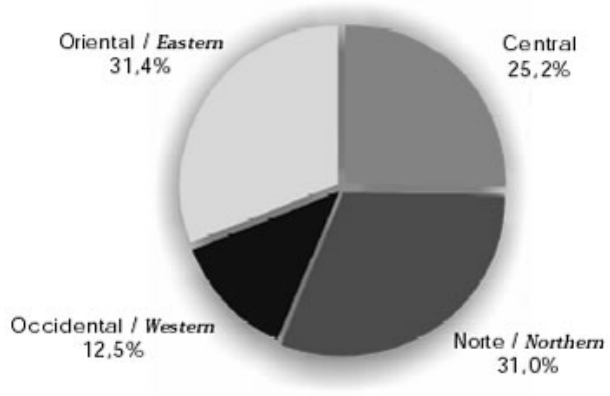


Figure 6.3: Distribution of Oil Palm Planted Area According to Zones[51]

Table 6.6: Distribution of Oil Palm Planted Area According to Zones (in hectares)[52],[53]

Año / *Year*	Área	Central / *Central*		Norte / *North*		Occidental / *West*		Oriental / *East*		Totales	
		ha	Part. (%)	ha	Part. (%)	ha	Part. (%)	ha	Part. (%)	ha	Part. (%)
1999	Sembrada 1/ *Planted*	37.013	*24,6*	39.678	*26,4*	20.971	*13,9*	52.737	*35,1*	150.399	*100*
	En producción / *Mature*	28.872	*22,5*	34.343	*26,7*	16.310	*12,7*	48.898	*38,1*	128.423	*100*
	En desarrollo / *Immature*	8.141	*37,0*	5.335	*24,3*	4.660	*21,2*	3.839	*17,5*	21.976	*100*
2000	Sembrada	39.126	*24,9*	42.817	*27,2*	21.602	*13,7*	53.783	*34,2*	157.328	*100*
	En producción	30.498	*22,6*	35.700	*26,5*	18.249	*13,5*	50.325	*37,3*	134.772	*100*
	En desarrollo	8.628	*38,3*	7.117	*31,6*	3.353	*14,9*	3.458	*15,3*	22.556	*100*
2001	Sembrada	44.227	*26,1*	46.923	*27,7*	23.230	*13,7*	55.184	*32,5*	169.564	*100*
	En producción	32.172	*23,2*	37.117	*26,8*	18.381	*13,3*	50.787	*36,7*	138.457	*100*
	En desarrollo	12.055	*38,8*	9.806	*31,5*	4.849	*15,6*	4.397	*14,1*	31.107	*100*
2002	Sembrada	48.825	*26,4*	54.259	*29,3*	25.056	*13,5*	57.025	*30,8*	185.165	*100*
	En producción	35.041	*24,2*	38.615	*26,6*	19.409	*13,4*	51.962	*35,8*	145.027	*100*
	En desarrollo	13.784	*34,3*	15.644	*39,0*	5.647	*14,1*	5.063	*12,6*	40.138	*100*
2003e	Sembrada	52.964	*25,2*	65.192	*31,0*	26.198	*12,5*	66.056	*31,4*	210.409	*100*
	En producción	37.013	*24,6*	39.678	*26,4*	20.971	*13,9*	52.737	*35,1*	150.399	*100*
	En desarrollo	15.951	*26,6*	25.514	*42,5*	5.227	*8,7*	13.319	*22,2*	60.010	*100*

6.8.2 Table 6.6 above provides a breakdown of the proportion of palm oil plantations in the zones over the 1999 to 2003 (estimated) period, this information is based on producers reporting, and therefore is likely to be an incomplete picture of cultivated areas. For example, only Fedepalma members may be being asked to report, reporters may be reporting wrong (under-/over-estimating), illegal plantations are unlikely to be reported.

6.8.3 Between 1999 and 2003 (estimated), Fedepalma identified a general increase in areas planted for palm oil cultivation within Colombia, the most significant increase was by 25,000ha in the Northern zone to 65,000ha, this combined with the Eastern zone (66,000ha) were estimated to be the largest palm oil production areas in Colombia in 2003 (estimated). The Western zone areas grew the least by 5,000ha to 21,000ha, the Central zones grew to 53,000ha during this period (see Table 6.6)[54].

Departments / Municipalities

6.8.4 According to the Fedepalma website, 73 municipalities[55] in Colombia contain productive areas of Palm oil, including:

- Northern - Magdalena, Norte del Cesar, Atlántico, Guajira;
- Central - Santander, Norte de Santander, sur del Cesar, Bolívar;
- Eastern - Meta, Cundinamarca, Casanare, Caquetá; and
- Western – Nariño.

6.8.5 Of these, the departments producing the most Palm oil, in order of highest to lowest, are: Meta (1), Cesar (2), Santander (3), Magdalena (4), Nariño (5), Casanare (6), Bolívar (7), Cundinamarca (8) y Norte de Santander (9).

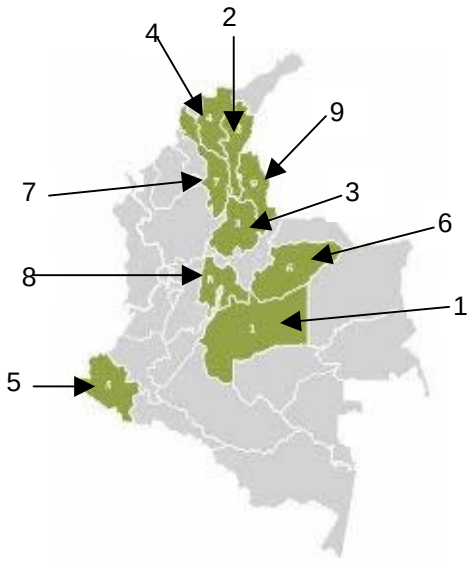


Figure 6.4: Major Palm oil producing municipalities in Colombia[56]

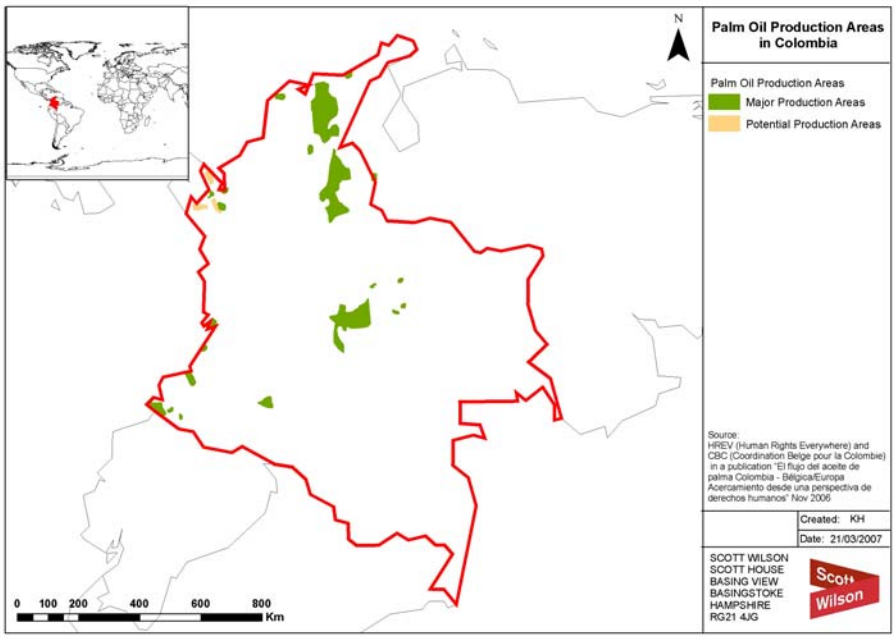


Figure 6.5: Major Palm Oil Production Areas in Colombia[57]

6.8.6 Figures 6.4 and 6.5 above depict the main palm oil producing municipalities and major areas of palm oil production, respectively. The date of the source of the Fedepalma information is not traceable, also the information from Fedepalma (Figure 6.4) is of a more general nature and not of a detailed extent as that provided by the organisation Human Rights Everywhere (Figure 6.5) which is from a report published in November 2006. Disparities may result from quality of data available to the organisations, sources of data, mapping ability, mapping scale, and age of data. The purpose for which the data is intended should also be taken account of when considered the confidence that one can place in it. For example, whilst identifying main production areas of palm oil the HREV may focus on areas in which human rights are most affected, whereas Fedepalma's purpose may be to promote palm oil production. It is evident that the figures above and the fact they are based on the 'main' areas of palm oil production tells us little without knowing all the production areas in the country and it's municipalities.

6.8.7 Further details on the areas of palm oil production are lacking both in mapped and tabulated data form, and subsequently those cultivated areas attributable to the UK imports. The relationship between the palm oil cultivation areas and the G200 Ecoregions within Colombia still needs to be established.

6.9 Commodity Production within G200 Ecoregions

6.9.1 There are no obvious information sources available which illustrate spatial distribution of areas of cultivation for specific countries. Figures 6.4 and 6.5 above show the main areas under cultivation for palm oil in Colombia. The Fedepalma information is undated and is

of a general provincial level, as such the more definitive and recent (Nov, 2006) areas identified in Figure 6.5 have been used to undertake an analysis of the G200 Ecoregions impacted by the main production areas of palm oil in Colombia.

6.9.2 It is apparent that data is available on areas of cultivation in the regions ('zones') of Colombia from Fedepalma. Whilst the date and completeness of Fedepalma data may be questionable, in terms of it being likely that only their members may potentially respond to surveys, the ability to gain information through the Fedepalma offers an avenue of further exploration. It is evident from the HREV report that more detailed information is potentially available outside the Fedepalma on cultivated areas. However, the inaccuracies in data, for example the constraints of the data, in that the currently mapped data is only for the main production areas, and the cumulative impacts of smaller plantations, may result in these missing data having significant impacts on a G200 ecoregion. Although there may potentially be some information available on total cultivated areas of palm oil it is evident that data is missing.

6.9.3 Even if we were able to accurately identify, in spatial terms, the areas of Ecoregions which are under palm oil production, it would be difficult to separate out the UK's consumption of palm oil from this area, without evidence of a direct connection between plantations on the ground and UK imports.

Table 6.7: Main areas of production areas (identified by HREV) within G200 Ecoregions[58]

G200 Ecoregion	Area under cultivation for palm oil (km²)	% of G200 Ecoregion in Colombia under cultivation
Amazon River and Flooded Forests	0	0%
Orinoco River & Flooded Forests	10,700	3%
Upper Amazon Rivers & Streams	1,286	0%
Guianan-Amazon (Amazon-Orinoco-Southern Caribbean) Mangroves	139	5%
Amazon River and Flooded Forests	0	0%
Chocó-Darién Moist Forests	13,243	9%
Guianan Highlands Moist Forests	0	0%
Llanos Savannas	9,002	6%
Napo Moist Forests	737	2%
Northern Andean Montane Forests	8,137	3%
Northern Andean Páramo	618	4%
Rio Negro-Juruá Moist Forests	0	0%
Panama Bight (South American Pacific) Mangroves	465	12%
Tumbesian-Andean Valleys Dry Forests	0	0%

6.9.4 From the HREV mapped data it is possible to determine from Table 6.7 that those G200 Ecoregions under the most pressure in Colombia are the Chocó-Darién Moist Forests and Orinoco River and Flooded Forests, with over 13,000 and 10,000km² cultivated respectively, and the Llanos Savannas (9,000km²) and Northern Andean Montane Forests (8,000km²). However, Table 6.7 also identifies that of areas of G200 Ecoregions in Colombia the Panama Bight (South American Pacific) Mangroves has proportionally the most area covered by the main palm producing areas (12% of it's area in Colombia).

The Chocó-Darién Moist Forests have 9% of the area in Colombia occupied by the main palm oil cultivation areas. Of the other G200 Ecoregions in Colombia the main areas under palm oil production are between 2 – 6% of the of their area in Colombia. The Tumbesian-Andean Valleys Dry Forest, Rio Negro-Juruá Moist Forest, Guianan Highlands Moist Forest, Amazon River and Flooded Forest, and Amazon River and Flooded Forests G200 Ecoregions, were reported in 2006 (in the HREV report) to not be under pressure.

6.9.5 In order to achieve accurate figures, GIS data will need to be developed, the responsibility for which may fall upon international (e.g. FAO and USDA), national (e.g. the Colombian Ministry of Agriculture and Rural Development[59]), provincial/municipality governments, or NGO, institutional and private organisational sources (e.g. Fedepalma). The development of inter-governmental links with the Colombian national government should be encouraged, however links may have to be developed with more provincial governments if the national government does not hold sufficiently detailed information on palm oil production in Colombia.

6.10 Confidence

6.10.1 In terms of confidence in the UNComtrade data on palm oil products imported to the UK from Colombia / exported from Colombia to the UK, there is reasonable confidence with which it can be said that the UK accounts for an estimated 40% of all palm oil exports from Colombia in 2005, however there may be greater disparities between import and export data between countries which are harder to justify/clarify.

6.10.2 It has not been possible to confidently identify staging countries for palm oil from Colombia to the UK, therefore the case study is based on direct import data from UNComtrade. The processing and product production in staging countries of palm oil from Colombia and subsequent import to the UK should be investigated through assessment of the supply chain of palm oil.

6.10.3 Identifying land take for the commodity in question is more difficult. One commodity may have many different derivatives all of which are making a contribution to biodiversity impacts. The FAO do supply data for the area of land under production for a commodity within a specific country in FAOSTAT. However not all commodities are available and in some cases not all the derivatives are included. There are often in country associations / boards or commodity based round tables that may also hold data.

6.10.4 Identifying where the land take occurs as a result of this commodity – some general evidence of areas affected is often available, e.g. the main provinces/regions of production may be identified by administrative boundaries. Spatial information (for example GIS) is much more difficult to come by, and may only identify the main areas of production, as with Colombia and Palm Oil cultivation. In Colombia the information available from the Ministry of Agriculture and Rural Development and relevant government municipality departments should be investigated further. Other data that

may be useful is regional data that may give an impression of the most intensive activities in relation to G200 Ecoregions.

6.10.5 The sources of information reported by Fedepalma and HREV should be investigated to identify the completeness and independence of reporting to establish any bias within data and the organisations. There is a lack of data on illegal or otherwise unreported palm oil production, however this gap in information may be difficult to; a) measure, and b) estimate. In-country sources may be able to provide this information, however this may present a health and safety risk in terms of mapping potentially inaccessible or dangerous areas.

6.10.6 Identifying UK companies operating or trading in a commodity - Difficult to locate an exhaustive list. Time consuming in terms of identifying stake in the commodity market in a particular country and in identifying specific locations of crops / plantations. Potentially very sensitive where information on sales by UK manufacturers is suppressed for commercial confidentiality. Consequently, it is not possible to calculate the share of UK market held by imports from Colombia[60].

6.10.7 Future scenarios – It is possible to identify recent trends in terms of land under production for a commodity within a specific country using FAOSTAT. However, not all commodities are available and in some cases not all the derivatives are covered. Anecdotal evidence and research into future policy can be undertaken for commodities and countries in question, however this is time consuming and is unlikely to be accurate to any level of certainty. This information is essential to policy makers, so as to be able to react and minimise adverse impacts before they occur.

6.11 Links and further information

- Fedepalma
  - http://www.fedepalma.org/index.shtm
- The Round Table on Sustainable Palm Oil –
  - http://www.rspo.org/
- Human Rights Everywhere
  - http://www.hrev.org/indexFlash.php

[37] RSPO (2004) Roundtable on Sustainable Palm Oil, 2004 RSPO Factsheet, Roundtable on Sustainable Palm Oil, Revised Version
[38] FAO(2002) FAO Agricultural Services Bulletin, Small-Scale Palm Oil Processing in Africa
[39] Available from: http://www.fao.org/docrep/006/t0309e/T0309E01.htm#ch1.5
[40] Source: FAO
[41] Source: UNComtrade
[42] (2232 (Palm nuts and kernels), 4222 (Palm oil, fractions), 4224 (Palm kernel oil, fractns), 08138 (Oilcake and other solid residues of oil from palm nuts or kernel)
[43] Source: UNComtrade

[44] Source: UNComtrade
[45] Source: UNComtrade
[46] nut equivalent, where cultivation of palm nuts is assumed to be representative of palm oil production.
[47] The website of Fedepalma, the federation representing Colombian Palm Oil growers, states that current production is 270,000Ha, however it has not been possible to clarify as yet the date of this source.
[48] Source: FAOSTAT.
[49] Where cultivation of palm nuts – kernel (nut equiv.) is assumed to be representative of palm oil production. Source: FAOSTAT
[50] Note: it has not been possible to define the exact boundaries of these 'zones' which are described by Fedepalma.
[51] Source: Fedepalma
[52] Note: 1/ The planted area refers to the net area, which is the surface occupied by oil palm, calculated based on the plant density reported by producers. According to the National Survey in 1997-1998, the net area to gross area ratio is 93.3%. e: estimated
[53] Source: Fedepalma
[54] Note: total area of palm oil cultivation in 2003 was estimated by Fedepalma as 210,000ha, Source National Survey on Plantations and Palm Oil Mills 1997-1998 and Surveys with Producers. However the reporting structure, completeness and accuracy of these estimates have not been confirmed.
[55] A compilation of municipalities based on the NUTE code list (2002-10-02) from a number of websites, see http://www.statoids.com/yco.html (Nov 2004), identified approximately 1,105 municipalities in Colombia.
[56] Source: Fedepalma
[57] Source: HREV (Human Rights Everywhere) and CBC (Coordination Belge pour la Colombie) in a publication "El flujo del aceite de palma Colombia - Bélgica/Europa Acercamiento desde una perspectiva de derechos humanos" Nov 2006
[58] Note: Marine G200 Ecoregions have been excluded from the above as they are not impacted by palm oil cultivation in Colombia.
[59] http://www.minagricultura.gov.co/ - an initial interrogation of the website by a Spanish speaker in March 2007 did not reveal any appropriate sources of data or information on Palm Oil Production in Colombia.
[60] HM Parliament: Written Answers to Questions [6 November 2006] - Palm Oil; Jon Cruddas to Secretary of State for Trade and Industry, Malcolm Wicks. Available from: http://www.publications.parliament.uk/pa/cm200506/cmhansrd/cm061106/text/61106w0016.htm

7 India and Cotton

7.1 Defining the Commodity

7.1.1 Cotton is a soft fibre that grows around the seeds of the cotton plant (*Gossypium* spp.), a shrub native to tropical and subtropical regions around the world, including the Americas, India, and Africa. The fibre is most often spun into thread and used to make a soft, breathable textile, which is the most widely used natural-fibre cloth in clothing today[61].

7.1.2 The UK imports cotton in a wide range of forms, indeed in its commodity listing there are over 300 entries for cotton in the UNComtrade database (under the HS 2002 classification systems). These commodities differ from raw cotton (HS02 – 5201) through to manufactured goods with cotton content such as jackets and blazers (HS02 – 610439). For the purposes of this pilot, the cotton imported of fabrics was selected, both with more than 85% cotton content and less than 85% cotton content.

7.2 Commodity Conditions

7.2.1 Cotton is primarily grown in dry tropical and subtropical climates at temperatures between 11°C and 25°C. It is a warm climate crop threatened by heat and freezing temperatures (below 5°C or above 25°C), although its resistance varies from species to species. Excessive exposure to dryness or moisture at certain stages of the plant development (lasting 5 to 7 months) may be detrimental to cotton quality and yields, and might also kill the plant[62].

7.3 Country Prioritisation

7.3.1 While some 80 countries from around the globe produce cotton, China (24%), the United States (20%), and India (16%) together produce over half the world's cotton[63]. The tables below illustrate the levels of cotton imports to the UK for global import partners. It is clear that India makes up a significant proportion of our imports (14% for 5208).

Table 7.1: 5208 Woven fabrics of cotton, containing 85 % or more by weight of cotton

Partner	Commodity	Trade Value (USD)	NetWeight (tonnes)
World	Woven fabrics of cotton, containing 85 % or more by weight of cotton	143,469,968	17,920
Pakistan	Woven fabrics of cotton, containing 85 % or more by weight of cotton	9,040,049	2,564
China	Woven fabrics of cotton, containing 85 % or more by weight of cotton	12,572,121	2,544
India	Woven fabrics of cotton, containing 85 % or more by weight of cotton	12,448,656	2,460
Turkey	Woven fabrics of cotton, containing 85 % or more by weight of cotton	9,878,071	1,878

Netherlands	Woven fabrics of cotton, containing 85 % or more by weight of cotton	13,667,943	1,460
Italy	Woven fabrics of cotton, containing 85 % or more by weight of cotton	28,381,276	928
Indonesia	Woven fabrics of cotton, containing 85 % or more by weight of cotton	2,800,939	776
France	Woven fabrics of cotton, containing 85 % or more by weight of cotton	7,144,782	696
Germany	Woven fabrics of cotton, containing 85 % or more by weight of cotton	6,411,471	678
Belgium	Woven fabrics of cotton, containing 85 % or more by weight of cotton	3,747,361	481

Table 7.2: 5209 Woven fabrics of cotton, containing 85 % or more by weight of cotton

Partner	Commodity	Trade Value (USD)	NetWeight (tonnes)
World	Woven fabrics of cotton, containing 85 % or more by weight of cotton	89,536,710	16,292
Italy	Woven fabrics of cotton, containing 85 % or more by weight of cotton	20,569,536	2,614
Pakistan	Woven fabrics of cotton, containing 85 % or more by weight of cotton	7,546,558	2,607
India	Woven fabrics of cotton, containing 85 % or more by weight of cotton	9,758,607	2,160
Netherlands	Woven fabrics of cotton, containing 85 % or more by weight of cotton	4,011,738	1,769
Belgium	Woven fabrics of cotton, containing 85 % or more by weight of cotton	5,850,300	842
Spain	Woven fabrics of cotton, containing 85 % or more by weight of cotton	7,342,685	782
Indonesia	Woven fabrics of cotton, containing 85 % or more by weight of cotton	1,602,437	673
Turkey	Woven fabrics of cotton, containing 85 % or more by weight of cotton	4,173,484	633
China	Woven fabrics of cotton, containing 85 % or more by weight of cotton	2,695,921	578
France	Woven fabrics of cotton, containing 85 % or more by weight of cotton	5,592,658	529

Table 7.3: 5210 Woven fabrics of cotton, containing less than 85 % by weight of cotton

Partner	Commodity	Trade Value (USD)	NetWeight (tonnes)
World	Woven fabrics of cotton, containing less than 85 % by weight of cotton	30,161,497	3,379
Indonesia	Woven fabrics of cotton, containing less than 85 % by weight of cotton	1,799,682	542
Belgium	Woven fabrics of cotton, containing less than 85 % by weight of cotton	4,957,293	456
Italy	Woven fabrics of cotton, containing less than 85 % by weight of cotton	4,949,982	442
Pakistan	Woven fabrics of cotton, containing less than 85 % by weight of cotton	1,136,129	324
Netherlands	Woven fabrics of cotton, containing less than 85 % by weight	3,153,811	298

	of cotton		
Spain	Woven fabrics of cotton, containing less than 85 % by weight of cotton	2,988,998	283
Turkey	Woven fabrics of cotton, containing less than 85 % by weight of cotton	1,996,990	242
France	Woven fabrics of cotton, containing less than 85 % by weight of cotton	3,149,081	174
Germany	Woven fabrics of cotton, containing less than 85 % by weight of cotton	1,225,862	172
India	Woven fabrics of cotton, containing less than 85 % by weight of cotton	275,330	116

Table 7.4: 5211 Woven fabrics of cotton, containing less than 85 % by weight of cotton

Partner	Commodity	Trade Value USD)	NetWeight (tonnes)
World	Woven fabrics of cotton, containing less than 85 % by weight of cotton	$72,778,312	8,281
Italy	Woven fabrics of cotton, containing less than 85 % by weight of cotton	$27,612,513	2,603
Belgium	Woven fabrics of cotton, containing less than 85 % by weight of cotton	$14,164,746	1,551
Bahrain	Woven fabrics of cotton, containing less than 85 % by weight of cotton	$2,128,417	941
Spain	Woven fabrics of cotton, containing less than 85 % by weight of cotton	$6,920,788	655
Thailand	Woven fabrics of cotton, containing less than 85 % by weight of cotton	$2,457,922	406
Netherlands	Woven fabrics of cotton, containing less than 85 % by weight of cotton	$1,832,462	372
France	Woven fabrics of cotton, containing less than 85 % by weight of cotton	$5,576,233	356
Germany	Woven fabrics of cotton, containing less than 85 % by weight of cotton	$2,439,677	348
Pakistan	Woven fabrics of cotton, containing less than 85 % by weight of cotton	$628,827	205
Turkey	Woven fabrics of cotton, containing less than 85 % by weight of cotton	$1,997,146	180

7.3.2 Table 7.5 provides an indication of the UK's significance in regard to the Indian export market for cotton (of this type). The highest proportion that the UK makes up is 4% of the total exports of 5209 and 5210 from Brazil. It can be assumed therefore that in terms of the economic leverage the UK may have over India, for cotton at least, it is insignificant (for instance, Bangladesh is responsible for ~20% of India's exports of 5209)

Table 7.5: Cotton export to the UK relative importance to India

Commodity	Trade Value (USD)	Net Weight (tonnes)	Estimated Proportion of UK market
5208 Woven fabrics of cotton, containing 85 % or more by weight of cotton	14081454	11005	3
5209 Woven fabrics of cotton, containing 85 % or more by weight of cotton	9071984	9071	4

5210 Woven fabrics of cotton, containing less than 85 % by weight of cotton	1504597	1504	4
5211 Woven fabrics of cotton, containing less than 85 % by weight of cotton	369264	369	1

7.4 Identification of Ecoregions and Threats

7.4.1 Table 7.6 below provides an indication of those G200 ecoregions wholly within and partly within the borders of India. The third column provides a figure for the net area of the G200 ecoregion found within the countries border.

Table 7.6: Ecoregions identified for India

Fresh water G200_REGIO	**Gross Area**	**Net Area in country Km2**
Indus River Delta	40512.06	2714.2
Western Ghats Rivers & Streams	155371.97	155371.97
Terrestrial G200	**Gross Area**	**Net Area in Country**
Chhota-Nagpur Dry Forests	122418.58	122418.58
Naga-Manapuri-Chin Hills Moist Forests	270525.63	108887.42
Southwestern Ghats Moist Forest	46406	46406
Eastern Deccan Plateau Moist Forests	340355.24	340355.24
Eastern Himalayan Alpine Meadows	118114.84	12173.74
Eastern Himalayan Broadleaf and Conifer Forests	165442	68458.33
Rann of Kutch Flooded Grasslands	27507.39	23761.03
Sundarbans Mangroves	3682.88	16884.89
Terai-Duar Savannas and Grasslands	11309.85	30942.26
Tibetan Plateau Steppe	1556562.99	52122.25
Western Himalayan Temperate Forests	83475.36	53260.68
Marine G200		
Andaman Sea	N/A	N/A
Maldives-Chagos-Lakshadweep Atolls	N/A	N/A

7.5 Fresh water

Indus River Delta

7.5.1 Dams on the river reduce flows in lower portions of the system and limit the transport of fertile sediments downstream into the delta. They also pose a serious threat to the survival of the Indus River dolphin, as the remaining dolphins become isolated into smaller groups.

7.5.2 Water extraction for irrigation, runoff of chemicals into the rivers, and introduced species also threaten the freshwater species of the delta.

Western Ghats Rivers & Streams

7.5.3 Urbanisation, construction of dams, water diversion projects, fish harvesting, conversion to agriculture (e.g., rubber plantations), deforestation and its consequent effects on water quality and flow regimes - pose the largest threats to freshwater systems in this ecoregion.

7.6 Terrestrial

Chhota-Nagpur Dry Forests

7.6.1 Logging, clearing, overgrazing, quarrying, mining, monocultures, and hydroelectric projects all pose threats to the ecoregion.

Naga-Manapuri-Chin Hills Moist Forests

7.6.2 Portions of this ecoregion are in relatively good condition. Major concerns include 'Jhum' (shifting) cultivation, clearing for fuel wood and fodder needs, forest fires, development projects, timber exploitation, hunting, and habitat loss. Burning and overgrazing in many areas leads to the trampling of soils, thus preventing regeneration.

Southwestern Ghats Moist Forest

7.6.3 India has the second largest human population in the world after China, and the quest for space and natural resources has led to increasing pressures on the Southwestern Ghats Moist Forests. Logging, agriculture, hydroelectric projects, and urban expansion are all taking a toll on the health of the region's natural communities.

Eastern Deccan Plateau Moist Forests

7.6.4 Shifting cultivation, quarrying, mining, large-scale agriculture, and hydroelectric projects have resulted in the clearing and degradation of many habitats. Conservation efforts are urgently needed to ensure that the remaining large habitat blocks are not lost.

Eastern Himalayan Alpine Meadows

7.6.5 Population growth has brought about livestock grazing, hunting of predators such as the Wolf and Snow leopard, medicinal plant collection, developmental activities like energy-harnessing dams on regional waterways, air and water pollution. Activities related to mountain tourism like trekking staff often cut slow-growing shrubs for firewood has also had negative effects.

Eastern Himalayan Broadleaf and Conifer Forests

7.6.6 Conversion of forest to agriculture land and exploitation of forests for timber, fodder and fuel wood (also used by trekkers and mountaineers) are some of the main threats to

biodiversity in this region. Additional threats to these forests include charcoal production in some low elevation areas and intensive grazing at higher elevations.

Rann of Kutch Flooded Grasslands

7.6.7 Despite the fact that areas in the Rann of Kutch remain largely intact, it is considered vulnerable to development activities such as construction and water diversion projects. Large portions of the Indus Delta have been destroyed as a result of logging for fuel wood and fodder, and grazing.

Sundarbans Mangroves

7.6.8 The harmful effects of sewage and industrial pollution plus continuing deforestation threaten the integrity of the Sundarbans.

7.6.9 Another problem is the effect of expanding agriculture due to which mangrove forests are cleared and irrigation canals are constructed in their place. Additionally, there is heavy pressure on the fisheries, including fishing along riverine tracts. The threat from offshore oil spills is also a serious one.

Terai-Duar Savannas and Grasslands

7.6.10 Poaching, overgrazing, clearing for cultivation, population growth, irrigation projects and water diversion are degrading oand destroying the grassland habitat and its wildlife.

Tibetan Plateau Steppe

7.6.11 Despite low population density, hunting threatens many species of mammals (especially the Argali and the Tibetan antelope, which are being slaughtered at an unsustainable rate for their high-quality wool) and large birds.

Western Himalayan Temperate Forests

7.6.12 The remaining forests of this ecoregion are threatened by increasing logging, conversion of land to agriculture, and fuelwood collection. Hunting is a popular activity in Pakistan and many people own guns.

Maldives-Chagos-Lakshadweep Atolls

7.6.13 The greatest threat to these reefs comes from the relatively rapid establishment, growth of the tourist industry, and the introduction of mechanised fishing. Coral mining, construction of groynes, breakwaters, and jetties, and anchor damage and siltation caused by speedboats are causing considerable damage as well.

7.6.14 Other threats include pollution, increased shipping traffic, risk of oil spills and dumping, inadequate waste disposal, and the overuse of water pumps and fertilisers for agriculture.

Andaman Sea

7.6.15 Increasing human settlement from the mainland as well as refugees from Bangladesh and Sri Lanka have lead to damaging activities such as exploitation and clearing of mangroves for agriculture and housing, illegal logging, and development of aquaculture. In addition to the above, development of tourism and recreational activities, all exert stress on the natural resources of these islands.

Maldives-Chagos-Lakshadweep Atolls

7.6.16 The greatest threat to these reefs comes from the relatively rapid establishment, growth of the tourist industry, and the introduction of mechanised fishing. Coral mining, construction of groynes, breakwaters, and jetties, and anchor damage and siltation caused by speedboats are causing considerable damage as well.

7.6.17 Other threats include pollution, increased shipping traffic, risk of oil spills and dumping, inadequate waste disposal, and the overuse of water pumps and fertilisers for agriculture.

7.7 Area of commodity production

7.7.1 The area of India harvested for cottonseed in 2005 was 8,823,000ha[64]. The chart below provides an illustration of the trends in area being harvested in India since 1990.

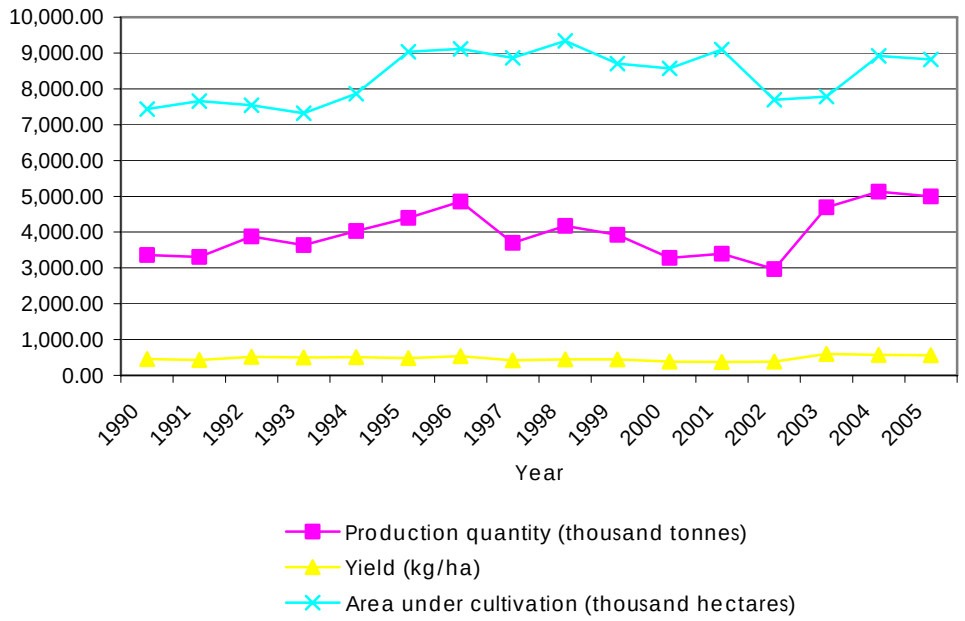
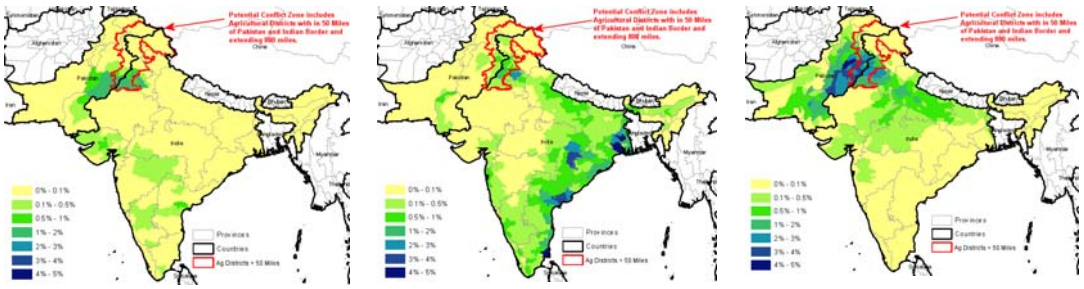


Figure 7.1: Area in India harvested for cottonseed over time[65]

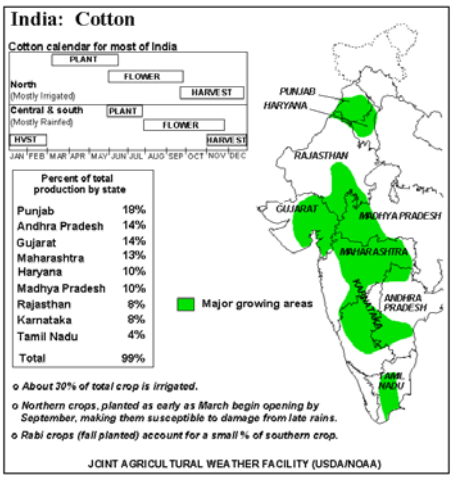
7.7.2 It is interesting to note that like Brazil, there are an array of crops cultivated in similar areas in India, such as wheat and rice. Figure 7.2 below provides an indication of where the growth can be found for these respective commodities.



Cotton **Rice** **Wheat**

Figure 7.2: Different agriculture intensities in India[66]

7.7.3 The figure below provides and indication of the main areas of cotton cultivation, in addition to illustrating the main states in India in relation to cotton production.



Major growing areas **Major cotton growing states[67]**

Figure 7.3: Main areas of cotton cultivation in India

7.8 Ecoregion links

7.8.1 The tracing of cotton to its source is fraught with difficulties. The two main areas that will skew results are:

- Classification – as discussed previously, cotton can be split into over 300 classifications in the HS system alone, therefore it is difficult to assess all types of cotton import. Notably, these are not additive measures, i.e. you cannot add t-shirts to cotton lint as one product is produced with the other and there is concentration into different classifications (i.e. it may take 1ha of cotton to produce 1kg of fabric, but it may take 5ha of cotton to produce a blazer).
- Rolling up – alternatively, we could roll up the classification into a two figure level of detail which would give us simply 'cotton'. However, this measure is monetary through UNComtrade which would be extremely misleading as the added value of some cotton products is not known (i.e. the value could be high but this is only because the UK is importing a lot of high value blazers, not because it is necessarily a high importer of cotton as a whole).

7.8.2 The table below shows more general data in regard to the relationships between the areas of cultivation of cotton in India and G200 ecoregions but does not attempt to link this to the proportion of UK exports.

Table 7.7: Ecoregion and commodity links

Ecoregion	Ecoregion threat	Net G200 ecoregion area in country (km²)	Area of G200 ecoregion under cultivation (km²)	Proportion of net G200 ecoregion area under cultivation
Indus River Delta	4, 5	2714.2	0	0%
Western Ghats Rivers & Streams	1, 4.	155371.97	37521.5	24%
Chhota-Nagpur Dry Forests	1, 4	122418.58	0	0%
Naga-Manapuri-Chin Hills Moist Forests	1, 4	108887.42	0	0%

Southwestern Ghats Moist Forest	1	46406	1278.67	3%
Eastern Deccan Plateau Moist Forests	1	340355.24	18839	6%
Eastern Himalayan Alpine Meadows	1, 4, 5	12173.74	0	0%
Eastern Himalayan Broadleaf and Conifer Forests	1	68458.33	0	0%
Rann of Kutch Flooded Grasslands	1, 4.	23761.03	4147	17%
Sundarbans Mangroves	1, 4, 5.	16884.89	0	0%
Terai-Duar Savannas and Grasslands	1, 4.	30942.26	0	0%
Tibetan Plateau Steppe	4	52122.25	0	0%
Western Himalayan Temperate Forests	1, 4.	53260.68	0	0%

7.9 Links and further information

- FAO
  - http://faostat.fao.org/
- Trade futures
  - http://www.tradefutures.cc
- UNCTAD
  - http://r0.unctad.org/infocomm/anglais/cotton/crop.htm

[61] Available from: http://en.wikipedia.org/wiki/Cotton
[62] UNCTAD. Available from: http://r0.unctad.org/infocomm/anglais/cotton/crop.htm
[63] PBS. Available from: http://www.pbs.org/now/shows/310/cotton-trade.html
[64] FAOStat. Available from: http://faostat.fao.org/site/340/DesktopDefault.aspx?PageID=340
[65] *Ibid*
[66] Trade Futures. Available from: http://www.tradefutures.cc/education/cotton/indcot[1].gif
[67] Uma Kambhampati, Stephen Morse, Richard Bennett, and Yousouf Ismael (2005) Perceptions of the Impacts of Genetically Modified Cotton Varieties: A Case Study of the Cotton Industry in Gujarat, India. *AgBioForum*. Vol 8, Number 2 & 3. Available from: http://www.agbioforum.org/v8n23/v8n23a13-f01.gif

8 India and Shrimps

8.1.1 Indian aquaculture has experienced a large amount of growth over the last 20 years or so, freshwater aquaculture accounting for >95 percent of the total aquaculture production. The production of shrimps in brackish water forms the major areas of shrimp activity. The farming of the giant river prawn (*Macrobrachium rosenbergii*) has increased recently, due to its high economic value, additionally, a high proportion of freshwater prawn production is exported. The development of brackish water aquaculture since the early 1990s has been confined to a single species; the giant tiger prawn (*Penaeus monodon*) [68].

8.1.2 With the development of more commercial hatcheries, a phenomenal increase in the area under shrimp farming occurred between 1990–1994, the formation of Brackish water Fish Farmers' Development Agencies (BFDA) in the maritime states and the implementation of various Governmental programs to provide support to the shrimp farming sector assisted with its further development.

8.1.3 The brackish water aquaculture sector is mainly supported by shrimp production as well as giant tiger prawn, which are responsible for the bulk of production followed by the Indian white prawn, *P. indicus*. The figure below illustrates the growth in this species exports.

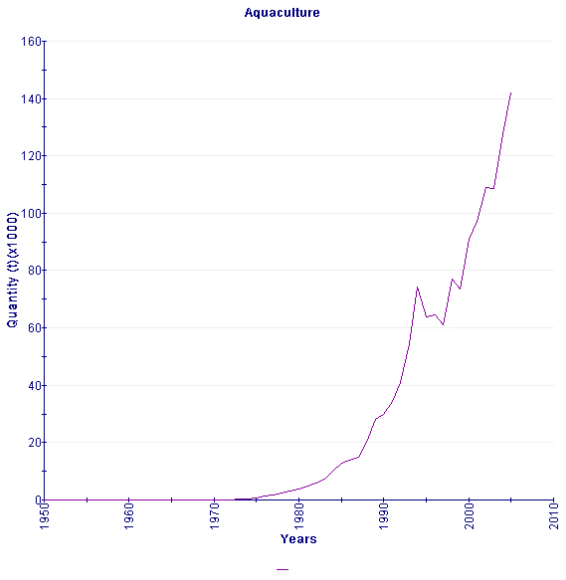


***Figure 8.1: Exports of* Penaeus monodon *from India*[69]**

8.2 Culture of giant river prawn

8.2.1 The giant river prawn (*Macrobrachium rosenbergii*) is the largest and fastest growing species being farmed and is under considerable demand both in domestic and international markets. *M. rosenbergii* is cultured either alone (monoculture) or in combination with carp (polyculture). The monoculture of giant river prawn is mostly confined to earthen ponds with moderate stocking densities of between 20,000–50,000/ha, fertilisation and supplementary feeding can result in a moderate yield of 600–1,000 kg/ha/8 months using single stocking and both single/multiple harvesting. The polyculture of freshwater prawn juveniles as densities at 10,000–15,000/ha alongside carp at 3,000–4,000/ha has also been demonstrated to be economically viable.

8.3 Global Trade Statistics and definitions

8.3.1 Table 8.1 to 8.3 show the key global export partners for shrimp from India. The UK does not represent a significant amount of the market for India (5 and 6% respectively). Notably, for unfrozen shrimp, the largest market is Sri Lanka, a country close to India. Frozen seafood, requiring more energy input to keep the items frozen and unspoiled is exported much further a field, raising the possible impacts of energy input and subsequent CO_2 emissions.

Table 8.1: Shrimps & prawns, prepd./presvd.

Partner	Commodity	Trade Value (USD)	NetWeight (tonnes)	Proportion or reporters market for this commodity
World	Shrimps & prawns, prepd./presvd.	122,757,783	33,971	
China	Shrimps & prawns, prepd./presvd.	10,023,442	3,944	12%
Belgium	Shrimps & prawns, prepd./presvd.	11,565,687	3,201	9%
Italy	Shrimps & prawns, prepd./presvd.	11,551,696	3,108	9%
Japan	Shrimps & prawns, prepd./presvd.	15,646,324	3,076	9%
USA	Shrimps & prawns, prepd./presvd.	8,084,421	2,782	8%
Spain	Shrimps & prawns, prepd./presvd.	7,382,373	2,677	8%
South Africa	Shrimps & prawns, prepd./presvd.	9,123,664	1,953	6%
United Arab Emirates	Shrimps & prawns, prepd./presvd.	8,477,166	1,673	5%
United Kingdom	Shrimps & prawns, prepd./presvd.	6,142,074	1,634	5%
Portugal	Shrimps & prawns, prepd./presvd.	3,614,191	1,376	4%

Table 8.2: Shrimps & prawns, whether or not in shell, frozen

Partner	Commodity	Trade Value (USD)	NetWeight (tones)	Proportion or reporters market for this commodity
World	Shrimps & prawns, whether or not in shell, frozen	853,040,790	165,834	
USA	Shrimps & prawns, whether or not in shell, frozen	284,602,038	64,811	39%

Japan	Shrimps & prawns, whether or not in shell, frozen	187,782,538	28,282	17%
Belgium	Shrimps & prawns, whether or not in shell, frozen	80,970,562	16,890	10%
United Kingdom	Shrimps & prawns, whether or not in shell, frozen	63,283,233	9,876	6%
Canada	Shrimps & prawns, whether or not in shell, frozen	31,573,020	7,183	4%
United Arab Emirates	Shrimps & prawns, whether or not in shell, frozen	29,098,934	5,686	3%
Malaysia	Shrimps & prawns, whether or not in shell, frozen	17,741,152	3,785	2%
Germany	Shrimps & prawns, whether or not in shell, frozen	21,067,502	3,668	2%
China	Shrimps & prawns, whether or not in shell, frozen	13,588,412	3,571	2%
France	Shrimps & prawns, whether or not in shell, frozen	17,892,978	3,214	2%

Table 8.3: Shrimps & prawns, whether or not in shell, other than frozen

Partner	Commodity	Trade Value (USD)	NetWeight (tonned)	Proportion or reporters market for this commodity
World	Shrimps & prawns, whether or not in shell, other than frozen	1,884,419	1,021	
Sri Lanka	Shrimps & prawns, whether or not in shell, other than frozen	629,774	803	79%
Mauritius	Shrimps & prawns, whether or not in shell, other than frozen	73,407	46	5%
United Arab Emirates	Shrimps & prawns, whether or not in shell, other than frozen	58,686	24	2%
France	Shrimps & prawns, whether or not in shell, other than frozen	60,953	20	2%
Japan	Shrimps & prawns, whether or not in shell, other than frozen	319,636	15	2%
Ireland	Shrimps & prawns, whether or not in shell, other than frozen	143,706	14	1%
China, Hong Kong SAR	Shrimps & prawns, whether or not in shell, other than frozen	149,054	12	1%
Thailand	Shrimps & prawns, whether or not in shell, other than frozen	29,885	11	1%
Singapore	Shrimps & prawns, whether or not in shell, other than frozen	25,643	10	1%
China	Shrimps & prawns, whether or not in shell, other than frozen	10,640	10	1%

8.4 Where are shrimps found?

8.4.1 There are two main types of shrimp used for aquaculture in India, the giant river prawn (*Macrobrachium rosenbergii*[70]) and the Giant Tiger Prawn (*Penaeus monodon*). Both are found in and round SE Asia and on both Indian coasts. Figures 8.2 - 8.5 below show their location on a country and global basis.

= Certain presence

Figure 8.2: Giant River Prawn (*Macrobrachium rosenbergii*) distribution globally[71]

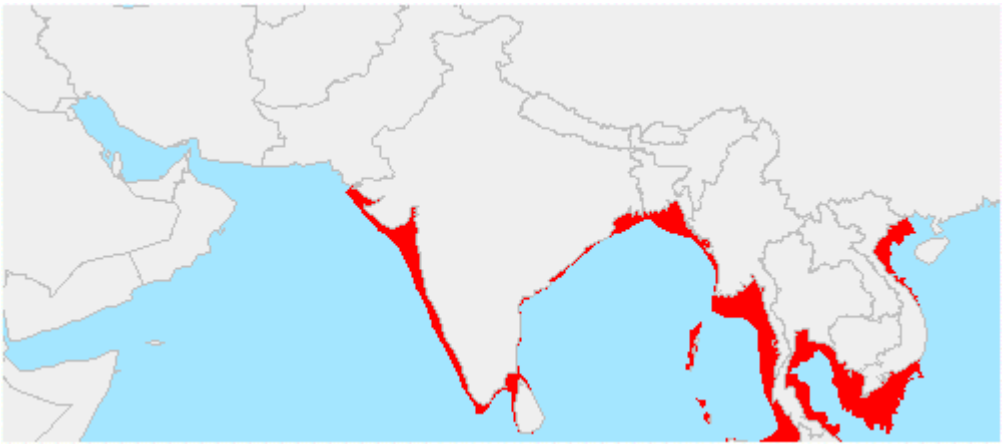


Figure 8.3: Giant River Prawn (*Macrobrachium rosenbergii*) distribution in India[72]

Figure 8.4: Giant Tiger Prawn (*Penaeus monodon*) distribution globally[73]

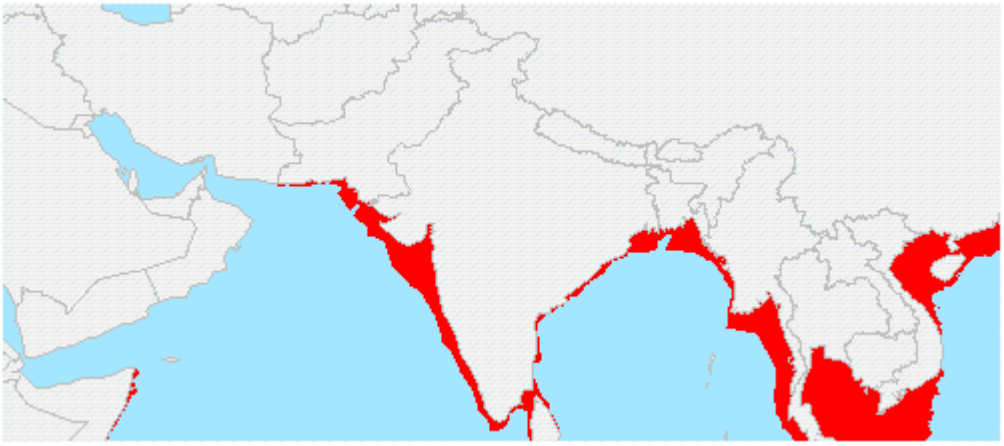


***Figure 8.5: Giant Tiger Prawn (*Penaeus monodon*) distribution India*[74]**

8.4.2 The area devoted to shrimp farming extends to as much as 152,000 ha producing approximately 115,000 tonnes, the majority of which is destined for export[75]. India utilises only about 40 percent of the available 2.36 million hectares of ponds and tanks for freshwater aquaculture and 13 percent of a total potential brackish water resource of 1.2 million hectares.

8.4.3 The state of Andhra Pradesh dominates the sector with over 86 percent of the total production in India with approximately 60 percent of the total water area dedicated to prawn farming, followed by West Bengal.

8.4.4 Currently about 91 percent of the shrimp farmers in India own less than 2 ha, 6 percent between 2 to 5 ha and the remaining 3 percent have an area of greater than 5 ha. This highlights the small scale nature of shrimp farming in India, making it difficult to pinpoint exactly where the farms are, and their size. **Andhra Pradesh** provides 47 percent of the area and contributes 50 percent of the total production. The farming of shrimp is largely dependant on small holdings of less than 2 ha, these farms account for over 90 percent of the total area utilised for shrimp culture, while large holdings of over 10 ha account for only 1.54 percent of the total. Many of the farm holdings located in **Kerala** and **West Bengal** belong to the traditional systems of shrimp farming.

8.4.5 Aquaculture resources in India include 2.36 million ha of ponds and tanks, 1.07 million ha of beels, jheels and derelict waters plus in addition 0.12 million km of canals, 3.15 million ha of reservoirs and 0.72 million ha of upland lakes that could be utilised for aquaculture purposes. Ponds in eastern India are typically homestead ponds of less than 1 ha in size.

Figure 8.6: Indian states

8.4.6 Freshwater aquaculture activity is prominent in the **eastern** part of the country, particularly the states of **West Bengal**, **Orissa** and **Andhra Pradesh** with new areas coming under culture in the states of **Punjab**, **Haryana**, **Assam** and **Tripura**. Brackish water aquaculture is mainly concentrated on the coasts of **Andhra Pradesh**, **Tamil Nadu**, **Orissa** and **West Bengal**.

8.4.7 If the ecoregions maps are referred to, it can be seen that the main marine G200 ecoregion is located on the south west of India and the same with the freshwater G200 ecoregions. There remains some overlap with the terrestrial G200 ecoregions and the *states* responsible for the majority of production but there seems to be little in the way of evidence showing whether there is any impacts on these terrestrial ecoregions or of the locations of aquaculture (including carp cultivation) in relation to the G200.

8.5 Links and further information

8.5.1 The main source of information on global aquaculture seems to be from the FAO. In particular they have developed a GIS system for fisheries which is very informative.

- http://www.fao.org/
- http://www.fao.org/figis/

[68] FAO National Aquaculture Sector Overview – India Available from: http://www.fao.org/fi/website/FIRetrieveAction.do?dom=countrysector&xml=naso_india.xml
[69] FAO. Available from: http://www.fao.org/figis/servlet/TabSelector#lastnodeclicked
[70] FAO. Available from: http://www.fao.org/fi/website/FIRetrieveAction.do?dom=culturespecies&xml=Macrobrachium_rosenbergii.xml
[71] FAO. Available from: http://www.fao.org/figis/servlet/FiRefServlet?ds=subservlet&xp_banner=none&session=species&url=http%3A%2F%2Fwww.fao.org%3A80%2Ffigis%2Fkimsmaps%2Fspecies%3Fquery%3Dmap%2CsNames%2CcNames%2Clegend%26outformat%3Dxml%26layerid%3D2608
[72] FAO. Available from: http://www.fao.org/figis/servlet/FiRefServlet?ds=subservlet&xp_banner=none&session=species&url=http%3A%2F%2Fwww.fao.org%3A80%2Ffigis%2Fkimsmaps%2Fspecies%3Fquery%3Dmap%2CsNames%2CcNames%2Clegend%26outformat%3Dxml%26layerid%3D2608
[73] FAO. Available from: http://www.fao.org/figis/servlet/FiRefServlet?ds=subservlet&xp_banner=none&session=species&url=http%3A%2F%2Fwww.fao.org%3A80%2Ffigis%2Fkimsmaps%2Fspecies%3Fquery%3Dmap%2CsNames%2CcNames%2Clegend%26outformat%3Dxml%26layerid%3D2608
[74] FAO. Available from: http://www.fao.org/figis/servlet/FiRefServlet?ds=subservlet&xp_banner=none&session=species&url=http%3A%2F%2Fwww.fao.org%3A80%2Ffigis%2Fkimsmaps%2Fspecies%3Fquery%3Dmap%2CsNames%2CcNames%2Clegend%26outformat%3Dxml%26layerid%3D2608
[75] FAO. Available from: http://www.fao.org/fi/website/FIRetrieveAction.do?dom=countrysector&xml=naso_india.xml

9 Indonesia, Malaysia and Palm Oil

9.1.1 Palm oil, extracted from tropical oil palms, is the world's largest oil crop after soya. The variety *Tenera*, cultivated in nearly all the world's plantations, gives the highest yield of any oil or oil seed crop, and is the main source of vegetable oil for many tropical countries[76]. The oil palm is now grown as a plantation crop in most countries with high rainfall (minimum 1 600 mm/yr) in tropical climates within 10° longitude of the equator[77].

9.2 Define commodity

9.2.1 Palm oil products include oil from the pulp of the fruit and from the kernel in either crude or a refined form, palm nuts and kernels and palm oil cake. UNComtrade data, SITC Rev 3, classifies palm oil into the following categories:

- Palm nuts and kernels
- Palm oil, crude
- Palm oil, refined, and its fractions
- Palm kernel or babassu oil, crude
- Palm kernel or babassu oil, refined, and fractions thereof
- Oilcake and other solid residues of oil from palm nuts or kernel

9.3 Commodity Conditions

9.3.1 Cultivation of the oil palm is most successful in countries where the climate is humid and hot all the year round. The optimum temperature for palm cultivation is between 25 and 28 degrees C, but can be grown between the range of 24-32°C. Oil Palm growth and productivity is greatest in warmer conditions, in cool conditions the oil palm is less productive and more susceptible to disease. The oil palm thrives in sunny and wet conditions requiring a plentiful supply of water; and grows best where the soil is flat, deep, permeable and rich in nutrients[78]. The oil palm can be cultivated at altitudes below 700m. It takes between the to four years before reaching maturity, and can remain productive for up to 20-25 years, and the oil palm has a very high yield in terms of fruit yield per hectare[79]. Figure 9.1 illustrates the suitability of rainfed oil palm across the globe.

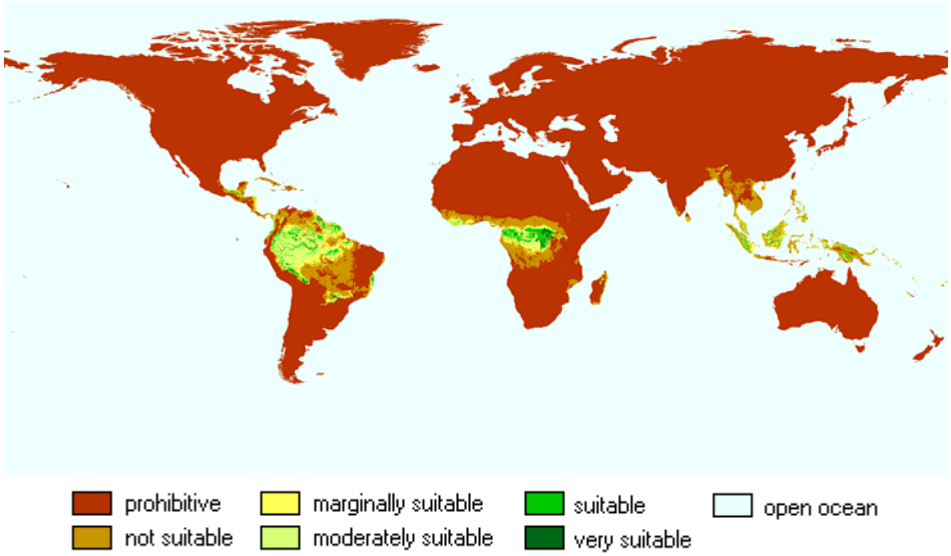


Figure 9.1: Crop Suitability for Rainfed Oil Palm, High Input Level, source: FAO

9.4 Country Prioritisation - Indonesia

9.4.1 Country prioritisation is based on Indonesia's importance to the UK as a trade partner for palm oil and its derived products. Table 9.1 below provides information on the UK's top import partners, and the global quantities attributable to the UK. None of the top five importers of palm products to the UK are SDD countries. Indonesia is the second largest import partner of palm products to the UK based on trade value.

9.4.2 In 2005, the UK imported approximately 4,785,440 tonnes of palm oil products from around the globe at the cost of approximately (USD)1bn. Crude palm nuts and kernels accounted for approximately 67% of palm oil product imports to the UK in 2005.

Table 9.1: UK Imports of Palm Oil Products (2005)

Commodity	SITC Rev 3 Code	Total value of UK imports (USD)	Total net weight of UK imports (tonnes)
Palm nuts and kernels	2232	590,932,719	3,185,656
Palm oil, refined, and its fractions	4222	309,388,561	652,109
Palm kernel or babassu oil, crude	4224	43,732,984	64,854
Oilcake and other solid residues of oil from palm nuts or kernel	08138	82,390,696	882,822
Total palm oil products	-	1,026,444,960	4,785,442

9.4.3 Table 9.2 identifies the top five import partners with the UK for palm oil products in 2005. These import partners have been identified from data provided by UNComtrade, which provides data on a trade value basis only for this level of detail. Indonesia was identified as the second largest import partner for palm products to the UK.

Table 9.2: The major import partners of palm oil products to the UK (2005)[80]

Import Partner	Trade Value (USD) of Palm Product Imports to the UK
Malaysia	$118,560,035
Indonesia	$81,467,953
Papua New Guinea	$77,477,013
Netherlands	$52,948,981
Colombia	$49,154,784
Other partners	$62,682,023

9.4.4 Table 9.3 provides palm oil product export data for Indonesia. It indicates that Indonesia exports approximately 13,131,028 tonnes of palm oil products to countries around the globe, of which approximately 0.5% is exported to the UK. This data is based on reporting in Indonesia, and suggests that 60,935 tonnes of palm oil product is shipped to the UK. It should be noted that import data reported at the UK end of chain suggests that the UK imports a substantially greater amount of palm oil products from Malaysia, in the region of 295,239 tonnes (see Table 9.4). This therefore reduces the confidence with which it can be said that the UK accounts for only 0.5% of all palm oil exports from Malaysia.

9.4.5 Furthermore it is known that the UK imports a substantial amount of palm oil and palm products from the Netherlands, which is known to be a staging country for trade in palm oil. It is however difficult to ascertain the proportion of UK palm product imports from the Netherlands that were originally imported from countries such as Indonesia. The Netherlands imported approximately 963,644 tonnes of palm products from Indonesia in 2005. The Netherlands then exported approximately 90,929 tonnes to the UK[81]. The quantity of palm products exported to the UK from the Netherlands roughly equates to one and a half times the amount reported to be exported from Indonesia to the UK (according to Indonesian reporting, see Table 9.3); and equates to almost a third of the weight of palm products imported from Indonesia to the UK (based on the UK reporting, see Table 9.4). This trade difference means that we cannot attribute palm products through the Netherlands to Indonesia as we actually record more palm products coming from the Netherlands (not a producer) than from Indonesia, potentially implying that we import more palm products from Indonesia than the statistics would indicate.

Table 9.3: Indonesian reported exports of palm products to the UK and globally

Commodity	SITC Rev 3 Code	Net Weight of all Indonesian exports to all countries (tonnes)	Net Weight of Indonesian exports to the UK (tonnes)	Indonesian palm oil exports to the UK as a % of the Net Weight of all Indonesian palm exports
Palm nuts and kernels	2232	73,149	18	0.00002
Palm oil, refined, and its fractions	4222	10,376,190	57,560	0.6
Palm kernel or babassu oil, crude	4224	1,043,195	3,375	0.3
Oilcake and other solid residues of oil from palm nuts or kernel	08138	1,638,493	-	-
Total palm oil products	-	13,131,028	60,935	0.5

9.4.6 Palm oil can be imported in a range of forms. Those most commonly imported into the UK from Indonesia (with their SITC3 codes) are: crude Palm oil, refined Palm oil and its fractions and Oilcake and other solid residues of oil from palm nuts or kernel.

9.4.7 In terms of supply of palm products to the UK, Indonesia is most significant in the provision of palm kernel oil, accounting for nearly 43% of UK imports. Indonesia also provides a large share of the UK's palm nuts and kernels, supplying approximately a 25% share of UK imports.

Table 9.4: UK reported imports of palm products from Indonesia

Commodity	SITC Rev 3 Code	Total net weight of UK imports (tonnes)	Weight of UK imports from Indonesia (tonnes)	Imports from Indonesia to the UK as a % of total UK imports (Net weight)
Palm nuts and kernels	2232	47,253	12,018	25.4
Palm oil, refined, and its fractions	4222	652,109	112,528	17.3
Palm kernel or babassu oil, crude	4224	64,854	27,541	42.5
Oilcake and other solid residues of oil from palm nuts or kernel	08138	882,822	143,150	16.2
Total palm oil products	-	1,647,040	295,239	17.9

9.4.8 In 2004, Europe was reported to account for 17% of all global palm oil imports[82].

9.5 Identification of Ecoregions - Indonesia

9.5.1 The ecoregions for Indonesia are easily identified through the WWF global ecoregions project. However, of more interest are the G200 ecoregions that have been identified as particularly valuable in regard to biodiversity. The figures below present the ecoregions present in Indonesia, including terrestrial, freshwater and marine. Additionally, table 9.5 provides the area for each ecoregion in km^2, located within Indonesia. The majority of Indonesia falls within a G200 ecoregion. It can therefore be assumed that the majority of oil palm products imported to the UK from Malaysia come from within G200 ecoregions.

Table 9.5: The Area of Ecoregions in Indonesia

Ecoregion	Area (km^2)
Terrestrial	
Western Java Montane Forests	26283.01
Borneo Lowland and Montane Forests	371348.97
Central Range Subalpine Grasslands	9775.3
Greater Sundas Mangroves	20127.32
Moluccas Moist Forests	38485.91
New Guinea Mangroves	17616.94
New Guinea Montane Forests	95590.09
Northern Australia and Trans-Fly Savannas	8025.39
Nusu Tenggara Dry Forests	50370.38
Peninsular Malaysia Lowland and Montane Forests	2216.54
Southern New Guinea Lowland Forests	144788.44

Sulawesi Moist Forests	175747.31
Sumatran Islands Lowland and Montane Forests	326896.79
Central Sulawesi Lakes	122797.39
Lakes Kutubu & Sentani	4206.81
New Guinea Rivers & Streams	251908.09
Sundaland Rivers & Swamps	799138.29
Andaman Sea	-
Banda Flores Sea	-

9.6 Threats to these ecoregions[83] - Indonesia

Western Java Montane Forests

9.6.1 Only five percent of the original habitat remains in this ecoregion, located as it is on the most densely populated island in Indonesia. Erosion and burning pose significant threats to the forest fragments that remain.

Central Range Subalpine Grasslands

9.6.2 Much of the Subalpine Grasslands ecoregion remains intact, although approximately one-fifth of the fragile ecoregion has been destroyed. Logging in the mountains causes soil erosion, while rivers that run through the grasslands are polluted from the mining of copper, gold, and other minerals.

Moluccas Moist Forests

9.6.3 Although much of this region is intact, logging and tapping of damar trees for resin present threats to the forests. In addition, some people illegally collect plants and animals from the forest.

New Guinea Mangroves

9.6.4 The coastal areas and deltas throughout the New Guinea Mangroves ecoregion are only sparsely populated by people. As a result, the mangroves remain relatively intact. However, some threats exist that could become serious problems in the future, such as increasing wood-chip production and logging, as well as pollution from oil and gas industries.

New Guinea Montane Forests

9.6.5 Logging, road construction, shifting cultivation, agricultural expansion, and related livestock activities all threaten the integrity of these forests.

Northern Australia and Trans-Fly Savannas

9.6.6 The greatest threats to the biodiversity of this ecoregion are fires, feral animals, alien weeds, and grazing.

Nusa Tenggara Dry Forests

9.6.7 As human populations grow on the islands, their activities present increased threats to the forests and wildlife. Accidental and deliberate fires are reducing the remaining blocks of forest. And cattle grazing has degraded many forest regions.

Southern New Guinea Lowland Forests

9.6.8 Logging is putting increased pressure on these forests, especially in coastal areas. Road construction, shifting cultivation, agricultural expansion, and plantation development all constitute additional threats.

Sulawesi Moist Forests

9.6.9 Although the forests of Sulawesi have so far been left relatively intact, logging pressures are increasing dramatically. In addition, it's becoming more and more common for people to burn the forest to clear land for agriculture.

Sumatran Islands Lowland and Montane Forests

9.6.10 Heavy logging on Sumatra has made the remaining stretches of forest critical for the protection of tigers, Sumatran rhinos, orangutans, and other animals. Commercial agriculture in the form of oil palm plantations has emerged in recent years as one of the most pervasive threats to the remaining forests of Sumatra, and indeed to all the forests of Indonesia

Central Sulawesi Lakes

9.6.11 The shores of Lake Matano contain large deposits of nickel. Mining for this metal causes pollution and destroys habitat. Commercial fishing, development, and the introduction of non-native species are among other threats to this ecoregion.

Lakes Kutubu & Sentani

9.6.12 This ecoregion is located within one of the least populated areas of Papua New Guinea, but Lake Kutubu is threatened by overfishing and nearby oil development, with associated road-building and potential for oil spills. Introduced species could be harmful to the endemic species in these lakes

New Guinea Rivers & Streams

9.6.13 Industrial logging and clearing of forests for commercial agriculture lead to increased erosion and altered water flows, which pose significant threats to the ecoregion. Road building in association with logging has opened up new lands to agriculture. Pollution from mining is a serious problem in this ecoregion, and pollution from industrial logging, agricultural processing, and urban sewage is also a threat. Overfishing, both for subsistence use and the commercial trade, threatens native species. Invasive exotic species such as tilapia and water hyacinth place additional stresses on native species,

and populations of exotics are apparently growing rapidly. Wildlife trade also threatens reptiles such as the saltwater crocodile, which is heavily hunted in the Sepik River region and elsewhere for its skin and live export.

Borneo Lowland and Montane Forests

9.6.14 Humans have been active in these forests for thousands of years, but in the past several decades they have had large and negative impacts on the land. The combination of commercial and illegal logging, large-scale agriculture for oil palm or tea, mining, dam construction, shifting cultivation, illegal collection of species, and infrastructure development has taken its toll. Well over half of the lowland forests are now gone, and in recent years large fires have scorched the land, whittling away at the remaining forests. If the current deforestation trend continues, Borneo's lowland forests, and their biodiversity, will be gone within a decade. Borneo's mountain forests have more protection and are not as economically attractive, so they still remain in good shape. However, it will only be a matter of time before they, too, will be threatened with destruction.

Peninsular Malaysian Lowland and Montane Forests

9.6.15 The major threats to this region come from logging in the highlands and lowlands, clearing of lowland forests for agriculture and urban development, tourism development, and road construction -- all of which are causing forest fragmentation and loss of wildlife.[84]

Sundaland Rivers and Swamps

9.6.16 Deforestation, conversion of land to agriculture, overfishing, the introduction of exotics, the aquaculture industry, and mining pollution threaten these habitats and their native species. Proposed hydropower dams on high-gradient streams would jeopardize natural flows and the movements of resident species.

Greater Sundas Mangroves

9.6.17 Until the 1970s, widespread logging throughout Indonesia had little affect on mangroves, but today they are the most threatened forests in the area. There are still large mangrove forests along the coast of eastern Sumatra, but trees in other parts of the island are disappearing faster than any other region in Indonesia. And although mangroves still stand throughout Kalimantan, the southern section of Borneo, they are harmed by increasing agriculture and urban development stemming from growing human populations. Mangroves are often destroyed when forests are converted to farmland or to ponds for extracting salt or for growing shrimp and fish. Forests are also cut down to make wood chips to sell around the world. Some species of animals, especially the saltwater crocodile and water monitor, are also declining quickly because of illegal hunting and trade.

9.7 Area of commodity production - Indonesia

9.7.1 The total land area under cultivation for Palm oil in Indonesia is approximately 5.15 Million Hectares[8586].

9.7.2 The FAO holds data on the area of land harvested for 'palm fruits' in Indonesia, but does not hold data for the area of land harvested for palm oil, palm kernels or palm kernel oil although these are commodity categories within the FAOSTAT database.

9.7.3 The total area of land harvested has increased steadily since 2000 according to data located at FAOSTAT (see Figure 9.2). The area harvested for palm fruit in 2005 was.

9.7.4 Potentially the methods of monitoring oil palm cultivation will have altered over time, and in recent years aerial photography and GIS technology may have been employed[87]. This may effect the the asessments of land area under cultivation in future years.

9.7.5 Areas under cultivation are important to understand the scale of impacts both in the past, present and future, that the palm industry is likely to have on biodiversity. It is also important to understand land use change as a result of palm cultivation, as this represents direct habitat loss. Neither the figure for area under cultivation, nor for area harvested, can necessarily be used to calculate new areas of habitat transformation as a result of oil palm cultivation.

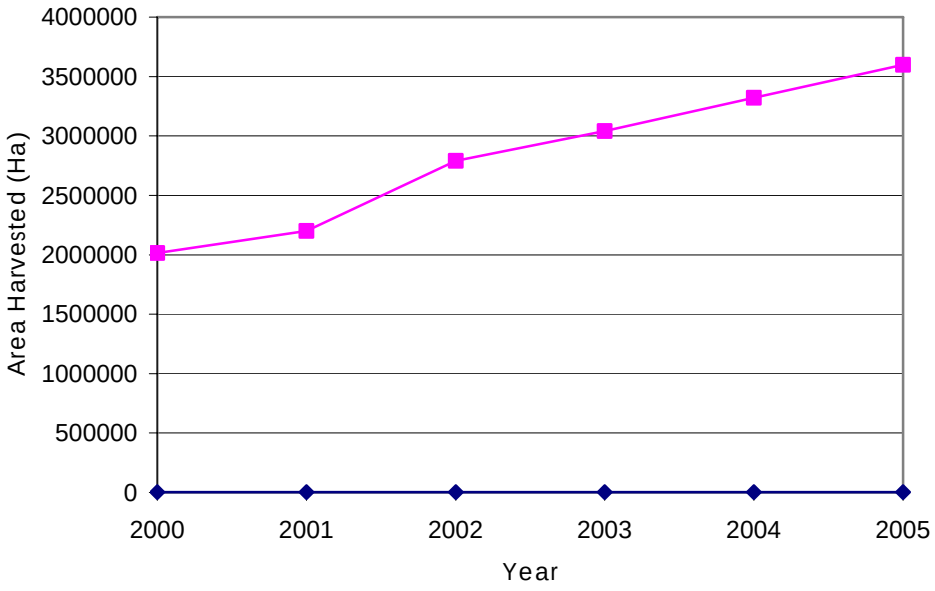


Figure 9.2: Area Harvested for Oil Palm Fruit in Indonesia between 2000 and 2005[88]

9.7.6 Indonesia's 2006 production is expected to rise to 14.7 million tonnes[89]. Oil palm investors have been keen to establish plantations in Sumatra since it possesses the best climate

and soil conditions in the country for cultivating oil palm and has necessary infrastructure already in place for initial processing. Areas for likely future develop in Sumatra include the provinces of Riau, Jambi and South Sumatra[90]. Expansion is proceeding rapidly in Kalimantan especially the western areas. Further rapid development of this crop is expected to occur in East Kalimantan, Sulawesi, and Irian Jaya, the Indonesian province on New Guinea[91]. Foreign investors interested in oil palm production have been mainly from Malaysia.

9.8 Location of Commodity Production - Indonesia

9.8.1 In 2005 Riau, West and Central Kalimantan and West Sumatra had the greatest areas under palm plantation (see Table 9.6), although this tells us little without knowing the entire area of each state.

Table 9.6: Area of Oil Palm Plantation, by Province[92]

Table1. Area of Oil Palm Plantation by Provinces

Provinoe	Area (Mn Ha)	
Nangroe Aceh Darusalam	0.22	
North Sumatra	0.68	
West Sumatra	0.20	
Riau	1.40	
The Rest of Sumatra	1.25	
Total Sumatra		3.75
Java	0.02	0.02
West Kalimantan	0.46	
Central Kalimantan	0.34	
South Kalimantan	0.20	
East Kalimantan	0.20	
Total Kalimantan		1.20
Sulawesi	0.12	0.12
Irian Jaya (Papua)	0.06	0.06
Total	5.15	5.15

9.8.2 *"In Sumatra, as of 2000, 70% of forest areas converted to oil palm plantations in Indonesia lay within the six Sumatran provinces of Riau (658,139 ha), Jambi (259,115 ha), Aceh (219,382),West Sumatra (134,885 ha), Central Kalimantan (120,413ha) and South Kalimantan (103,557 ha)"[93].*

9.8.3 No spatial data or mapping was located during this assessment.

9.9 Commodity Production within G200 Ecoregions - Indonesia

9.9.1 There are no obvious information sources available which illustrate spatial distribution of areas under cultivation for palm oil for the whole of Indonesia. Although GIS does appear to have been used in the mapping of oil palm plantations for areas within Indonesia[94].

9.9.2 The majority of Indonesia falls within G200 ecoregions, and it can therefore be assumed that the majority of palm oil imported to the UK also comes from within G200 ecoregions. In terms of identifying the exact location of palm oil cultivation in Indonesia, and the areas most heavily effected, this is not currently possible given that no source of spatial information or mapping of palm oil cultivation has been identified.

9.9.3 The spatial data available relates to the suitability of land for the cultivation of palm (see Figure 9.3), and to the distribution of agricultural estates in Indonesia[95] (see Figure 9.4). This information provides some clue as to where palm may be cultivated, but is extremely uncertain and lacks full geographic coverage. Data relating to the locations of agricultural estates relate not only to palm but also to other crops such as rubber for example.

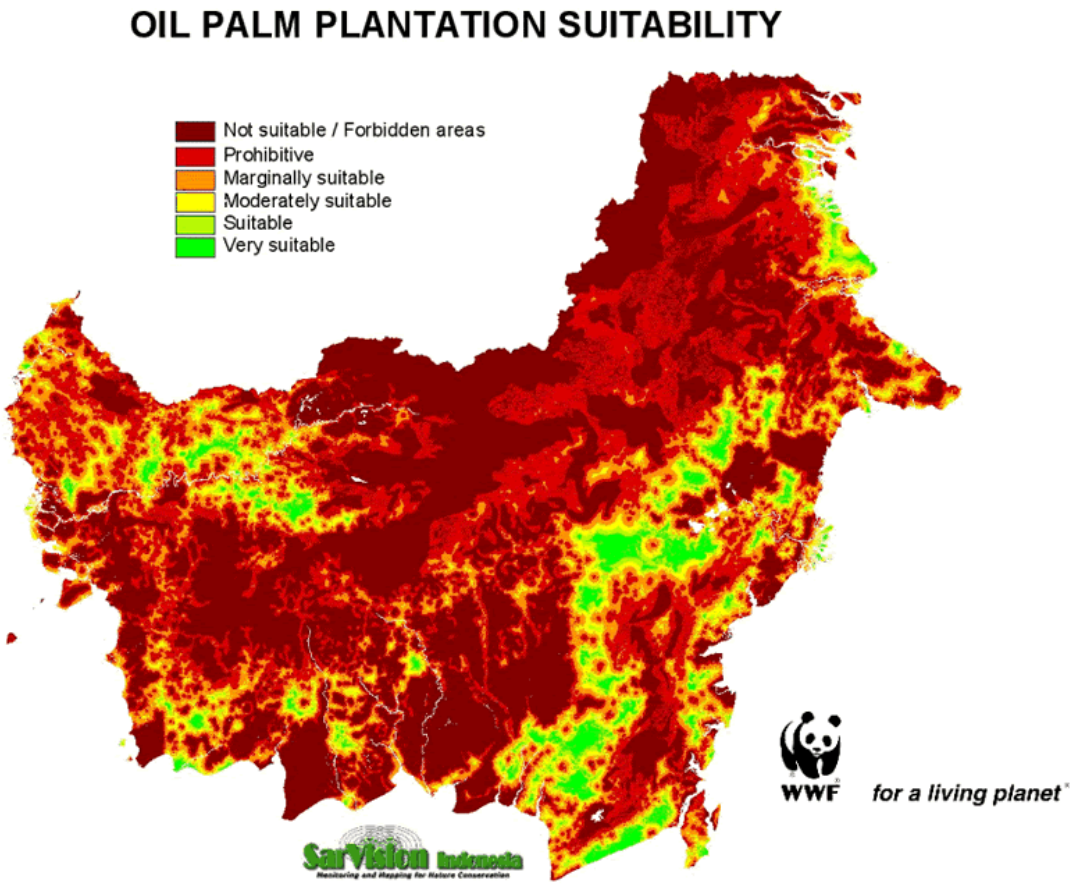


Figure 9.3: Oil Palm Plantation Suitability in Indonesian Borneo (Kalimantan)[96]

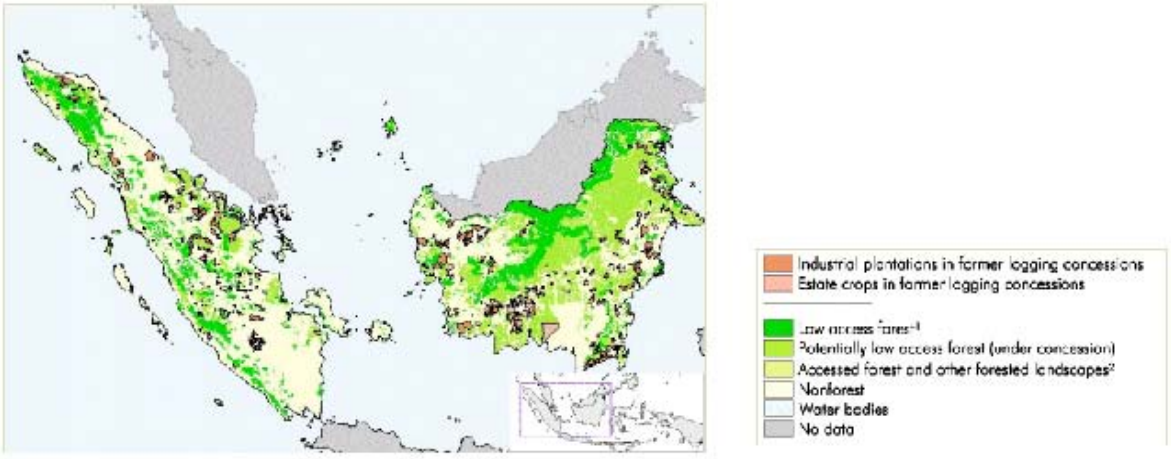


Figure 9.4: State of the Forest: Indonesia: Plantations in Former Logging Concessions, Sumatra and Kalimantan[97]

9.9.4 If we were to be able to identify in spatial terms the areas of ecoregions under production, it would still be difficult to separate out the UK's consumption of palm oil from this area, without evidence of a direct connection between plantations on the ground and UK imports. What can be stated is that the UK's share of trade in oil palm is likely to be putting pressure on G200 ecoregions, (as the majority of Indonesia falls within a G200 ecoregion).

9.10 Country Prioritisation - Malaysia

9.10.1 Table 9.7 identifies the top five UK import partners for palm products in 2005, these were Malaysia, Indonesia, Papua New Guinea, Netherlands and Colombia. These import partners have been identified from data provided by UNComtrade, which provides aggregated data on a trade value basis only.

Table 9.7: The major import partners of palm oil products to the UK (2005)[98]

Import Partner	Trade Value (USD) of Palm Product Imports to the UK
Malaysia	$118,560,035
Indonesia	$81,467,953
Papua New Guinea	$77,477,013
Netherlands	$52,948,981
Colombia	$49,154,784
Other partners	$62,682,023

9.10.2 Table 9.8 provides palm product export data for Malaysia. It indicates that Malaysia exports approximately 14,375,164 tonnes of palm oil products to countries around the globe, of which approximately 0.6% is exported to the UK. This data is based on reporting in Malaysia, and suggests that 83,864 tonnes of palm products were shipped to the UK in 2005. It should be noted that import data reported at the UK end of trade chain suggests that the UK imports a substantially greater amount of palm oil products from Malaysia, in the region of 804,963 tonnes (see Table 9.9). This therefore reduces the confidence with

which it can be said that the UK accounts for only 0.6% of all palm oil exports from Malaysia.

9.10.3 Furthermore it is known that the UK imports a substantial amount of palm oil and palm products from the Netherlands, which is known to be a staging country for trade in palm oil. It is however difficult to ascertain the proportion of UK palm product imports from the Netherlands that were originally imported from Malaysia. The Netherlands imported approximately 1,867,206 tonnes of palm products from Malaysia in 2005. The Netherlands then exported approximately 90,929 tonnes to the UK[99100]. The quantity of palm products exported to the UK from the Netherlands roughly equates to the amount reported to be exported from Malaysia to the UK (according to Malaysian reporting, see Table 9.8); and equates to approximately one ninth of the weight of palm products imported from Malaysia to the UK (based on the UK reporting, see Table 9.4).

Table 9.8: Malaysian exports of palm oil to the UK and globally (2005)

Commodity	SITC Rev 3 Code	Net Weight of all Malaysian exports to all countries (tonnes)	Net Weight of Malaysian palm product exports to the UK (tonnes)	Malaysian palm oil exports to the UK as a % of the Net Weight of all Malaysian palm exports
Palm nuts and kernels	2232	125	-	-
Palm oil, refined, and its fractions	4222	882,822	38,594	0.3
Palm kernel or babassu oil, crude	4224	1,269,016	2,597	0.2
Oilcake and other solid residues of oil from palm nuts or kernel	08138	1,755,472	42,673	2.4
Total palm oil products	-	14,375,164	83,864	0.6

9.10.4 Palm oil can be imported in a range of forms. Those most commonly imported into the UK directly from Malaysia (with their SITC3 codes) are: Palm oil, crude; Palm oil, refined, and its fractions; and Oilcake and other solid residues of oil from palm nuts or kernel. The increased demand for palm oil as a biofuel will register through the statistics as a increase in palm oil imports as biofuel is not imported as a 'fuel' but as an agricultural product, it is then refined in the UK into biofuels.

9.10.5 In terms of supply of palm products to the UK, Malaysia is most significant in the provision of oilcake and other solid residues of oil from palm nuts or kernels, accounting for nearly 75% of UK imports. Malaysia also provides a large share of the UK's palm oil (crude and refined) and palm kernel oil, supplying approximately a 17% and 11% share of UK imports respectively.

Table 9.9: The Malaysian share of total UK imports of palm products (calculated by weight)

Commodity	SITC Rev 3 Code	Total net weight of UK imports (tonnes)	Weight of UK imports from Malaysia (tonnes)	Imports from Malaysia to the UK as a % of total UK imports (Netweight)

Palm nuts and kernels	2232	3,185,656	9,626,550	0.2
Palm oil, refined, and its fractions	4222	6,521,09	115,473	16.9
Palm kernel or babassu oil, crude	4224	64,854	6,989	11.1
Oilcake and other solid residues of oil from palm nuts or kernel	08138	882,822	672,872	73.6
Total palm oil products	-	4,785,442	804,963	11.6

9.11 Identification of Ecoregions - Malaysia

9.11.1 The ecoregions for Malaysia are easily identified through the WWF global ecoregions project. However, of more interest are the G200 ecoregions that have been identified as particularly valuable in regard to biodiversity[101].

9.11.2 G200 ecoregions include the ecoregions with "exceptional levels of biodiversity, such as high species richness or endemism, or those with unusual ecological or evolutionary phenomena. As these are the best examples of ecoregions, they are likely to remain so, unless damage to ecoregions is so major as to eradicate the exceptional levels of biodiversity for which they have been classified.

9.11.3 Table 9.10 provides the area, in km^2, for each ecoregion that is located within Malaysia.

9.11.4 Almost the entire area of Malaysia falls within a G200 ecoregion. It can therefore be assumed that the majority of oil palm products imported to the UK from Malaysia come from within G200 ecoregions.

Table 9.10: The Area of Ecoregions in Malaysia

Ecoregion	Area (km^2)
Terrestrial	
Peninsular Malaysian Lowland and Montane Forests	122858
Greater Sundas Mangroves	5994
Kayah-Karen/Tenasserim Moist Forests	2278
Borneo Lowland and Montane Forests	164249
Kinabalu Montane Shrublands	4339
Freshwater	
Sundaland Rivers and Swamps	231088
Marine	
Andaman Sea	-
Banda Flores Sea	-

9.12 Threats to these ecoregions[102] - Malaysia

Peninsular Malaysian Lowland and Montane Forests

9.12.1 The major threats to this region come from logging in the highlands and lowlands, clearing of lowland forests for agriculture and urban development, tourism

development, and road construction -- all of which are causing forest fragmentation and loss of wildlife.

Sundaland Rivers and Swamps

9.12.2 Deforestation, conversion of land to agriculture, overfishing, the introduction of exotics, the aquaculture industry, and mining pollution threaten these habitats and their native species. Proposed hydropower dams on high-gradient streams would jeopardize natural flows and the movements of resident species.

Kayah-Karen/Tenasserim Moist Forests

9.12.3 Past logging and land clearance for farms and rubber plantations have already destroyed extensive sections of these forests. Today, both legal and illegal logging continue, altering habitat and, in the case of large-scale clearcutting, causing soil erosion. Dams, highways, and other development pressures are also a concern in these forests.

Borneo Lowland and Montane Forests

9.12.4 Humans have been active in these forests for thousands of years, but in the past several decades they have had large and negative impacts on the land. The combination of commercial and illegal logging, large-scale agriculture for oil palm or tea, mining, dam construction, shifting cultivation, illegal collection of species, and infrastructure development has taken its toll. Well over half of the lowland forests are now gone, and in recent years large fires have scorched the land, whittling away at the remaining forests. If the current deforestation trend continues, Borneo's lowland forests, and their biodiversity, will be gone within a decade. Borneo's mountain forests have more protection and are not as economically attractive, so they still remain in good shape. However, it will only be a matter of time before they, too, will be threatened with destruction.

Kinabalu Montane Shrublands

9.12.5 This incredible diversity has remained intact because few people live in the northern parts of Borneo. But all of this is changing as more and more tourists come to visit. Places for them to stay are being built, and people often trample or pick plants and flowers. Another big problem is the logging of rare tropical trees for timber. In addition, parts of the Kinabalu Park are being cleared for agriculture, mined for minerals, and turned into golf courses.

Greater Sundas Mangroves

9.12.6 Until the 1970s, widespread logging throughout Indonesia had little affect on mangroves, but today they are the most threatened forests in the area. There are still large mangrove forests along the coast of eastern Sumatra, but trees in other parts of the island are disappearing faster than any other region in Indonesia. And although

mangroves still stand throughout Kalimantan, the southern section of Borneo, they are harmed by increasing agriculture and urban development stemming from growing human populations. Mangroves are often destroyed when forests are converted to farmland or to ponds for extracting salt or for growing shrimp and fish. Forests are also cut down to make wood chips to sell around the world. Some species of animals, especially the saltwater crocodile and water monitor, are also declining quickly because of illegal hunting and trade.

9.13 Area of commodity production - Malaysia

9.13.1 The total land area under cultivation for Palm oil in Malaysia was 3,875,327 Ha in 2004. this data was obtained from the Malasian Palm oil board website.

9.13.2 The FAO holds data on the area of land harvested for Palm Fruits in Malyasia, but does not hold data for the area of land harvested for palm oil, palm kernels or palm kernel oil although these are commodity categories within the FAOSTAT database. Area of land harvested may not represent the full extent of land under palm cultivation, as it takes 3-4 years for oil palm trees to reach maturity, and immature plantation is unlikely to be harvested.

9.13.3 The area harvested for palm fruit increased by approximately 5,000,000 hectares between 2000 and 2005 (see Figure 9.2).

9.13.4 The total area of land cultivated has increased steadily since the mid 1970s according to data issued by the Malaysian Palm Oil Board. This data however has been supplied by two separate organisations over the years, and it is unclear as to what methods have been used. Potentially the methods of monitoring oil palm cultivation will have altered, and in recent years aerial photography and GIS technology may have been employed.

9.13.5 Areas under cultivation are important to understand the scale of impacts both in the past, present and future, that the palm industry is liklely to have on biodiversity. It is also important to understand land use change as a result of palm cultivation, as this represents direct habitat loss. Neither the figure for area under cultivation, nor for area harvested necessarily can be used to calculate new areas of palm plantations, that would correlate with habitat transformation due to oil palm cultivation.

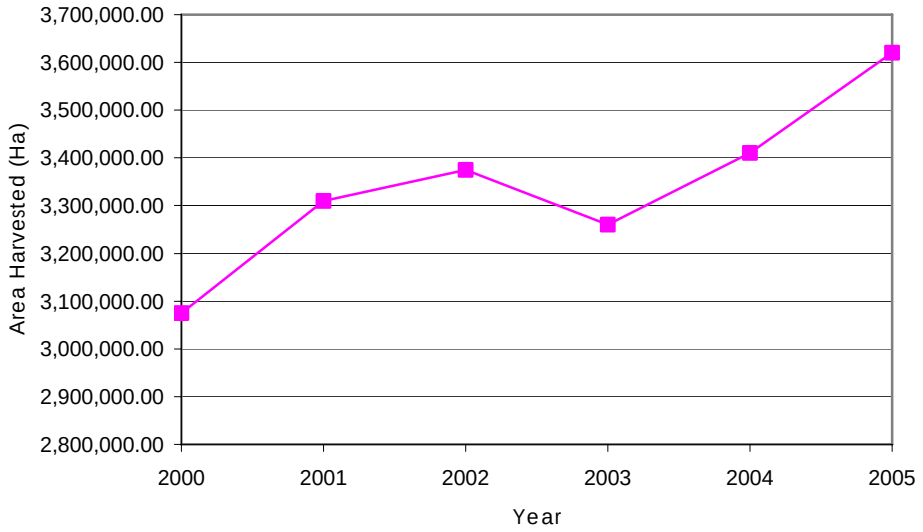


Figure 9.5: Area Harvested for Oil Palm Fruit in Malaysia between 2000 and 2005 (Hectares)[103]

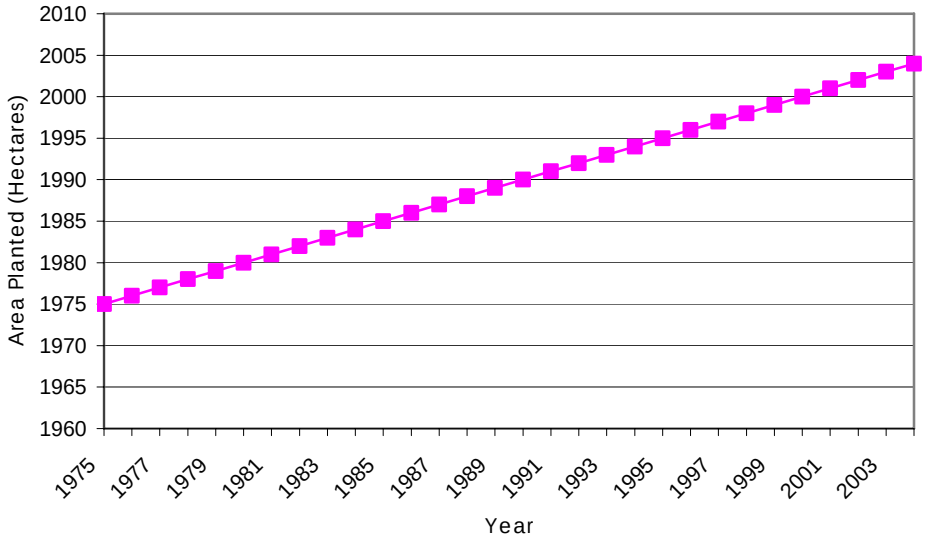


Figure 9.6: Oil Palm Planted Area in Malaysia: 1975-2004 (Hectares)

9.14 Location of Commodity Production

Table 9.11: Area under oil palm by region (1975 - 2004)

OIL PALM PLANTED AREA:1975-2004 (HECTARES)

Year	P.Malaysia	Sabah	Sarawak	Total
1975	568,561	59,139	14,091	641,791
1976	629,558	69,708	15,334	714,600
1977	691,706	73,303	16,805	781,814
1978	755,525	78,212	19,242	852,979
1979	830,536	86,683	21,644	938,863
1980	906,590	93,967	22,749	1,023,306
1981	983,148	100,611	24,104	1,107,863
1982	1,048,015	110,717	24,065	1,182,797
1983	1,099,694	128,248	25,098	1,253,040
1984	1,143,522	160,507	26,237	1,330,266
1985	1,292,399	161,500	28,500	1,482,399
1986	1,410,923	162,645	25,743	1,599,311
1987	1,460,502	182,612	29,761	1,672,875
1988	1,556,540	213,124	36,259	1,805,923
1989	1,644,309	252,954	49,296	1,946,559
1990	1,698,498	276,171	54,795	2,029,464
1991	1,744,615	289,054	60,359	2,094,028
1992	1,775,633	344,885	77,142	2,197,660
1993	1,831,776	387,122	87,027	2,305,925
1994	1,857,626	452,485	101,888	2,411,999
1995	1,903,171	518,133	118,783	2,540,087
1996	1,926,378	626,008	139,900	2,692,286
1997	1,959,377	758,587	175,125	2,893,089
1998	1,987,190	842,496	248,430	3,078,116
1999	2,051,595	941,322	320,476	3,313,393
2000	2,045,500	1,000,777	330,387	3,376,664
2001	2,096,856	1,027,328	374,828	3,499,012
2002	2,187,010	1,068,973	414,260	3,670,243
2003	2,202,166	1,135,100	464,774	3,802,040
2004	2,201,606	1,165,412	508,309	3,875,327

Source : Department of Statistics, Malaysia : 1975 to 1984
: MPOB : 1985 - 2004

Table 9.12: Area under oil palm by state (2004)

AREA UNDER OIL PALM (MATURE AND IMMATURE) BY 2004 (HECTARES)

State	Mature	Immature	Total
Johore	604,940	61,428	666,368
Kedah	65,566	6,755	72,321
Kelantan	69,875	17,769	87,644
Malacca	46,504	3,082	49,586
N. Sembilan	121,357	19,788	141,145
Pahang	517,876	60,972	578,848
Penang	13,658	210	13,868
Perak	270,067	32,871	302,938
Perlis	35	0	35
Selangor	118,342	9,046	127,388
Terengganu	135,909	25,556	161,465
P.Malaysia	**1,964,129**	**237,477**	**2,201,606**
Sabah	1,081,102	84,310	1,165,412
Sarawak	405,729	102,580	508,309
Sabah/Sarawak	**1,486,831**	**186,890**	**1,673,721**
MALAYSIA	**3,450,960**	**424,367**	**3,875,327**

Source :MPOB

9.14.1 In 2004 Johore, Pahang, and Sabah had the greatest areas under palm plantation, although this tells us little without knowing the entire area of each state.

Table 9.13: Distribution of oil palm planted area by category (2003/2004) (Hectares)

Category	2003		2004	
	Hectares	%	Hectares	%
Private Estates	2,248,014	59.13	2,333,631	60.22
Govt. Schemes:				
FELDA	630,330	16.58	611,759	15.78
FELCRA	155,937	4.10	160,314	4.14
RISDA	59,497	1.57	80,778	2.08
State Schemes	320,265	8.42	322,359	8.32
Smallholders	387,998	10.20	366,486	9.46
TOTAL	**3,802,040**	**100.00**	**3,875,327**	**100.00**

Source : MPOB

9.14.2 In the ten years leading up to 2004, the greatest increase in the amount of land under plantation regionally was in sabah, which experienced an increase of approximately 713,000 Hectares[104]

9.15 Commodity Production within G200 Ecoregions - Malaysia

9.15.1 There are no obvious information sources available which illustrate spatial distribution of areas of oil palm cultivation for specific countries. No spatial data has been located that shows the coverage of oil palm across the full extent of Malaysia. It has therefore not been possible to overlay data in order to calculate the area of ecoregions under cultivation for palm.

9.15.2 The figure below shows areas under cultivation for palm oil in Sabah and Sarawak. This information is dated, and there does not appear to be updated or similar information available for Peninsular Malaysia. It is important that data is as current as possible, especially considering the commodity in question. The oil palm sector has grown in recent years and is expected to expand rapidly in the coming years if biofuels take off as a source of transport fuel and energy.

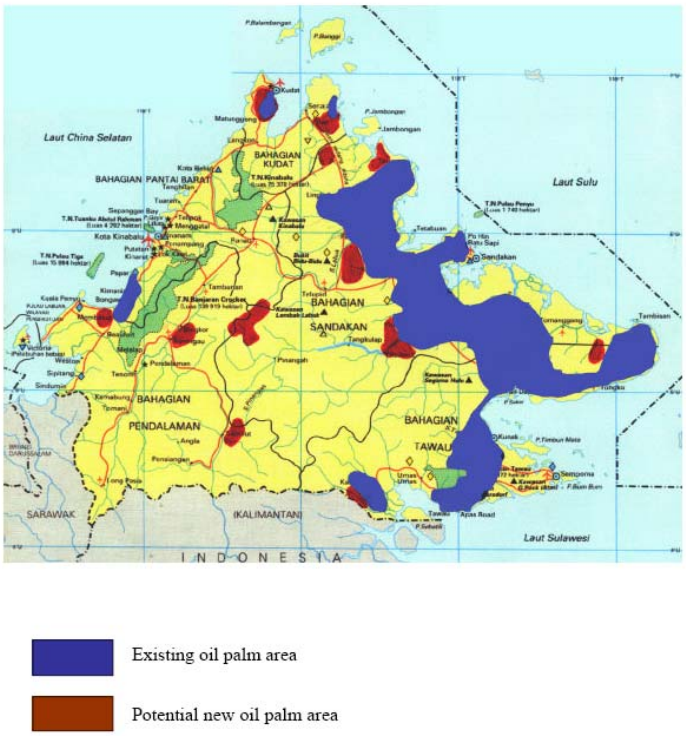


Figure 9.7: Existing and potential areas of oil palm plantation in Sabah (2000)[105]

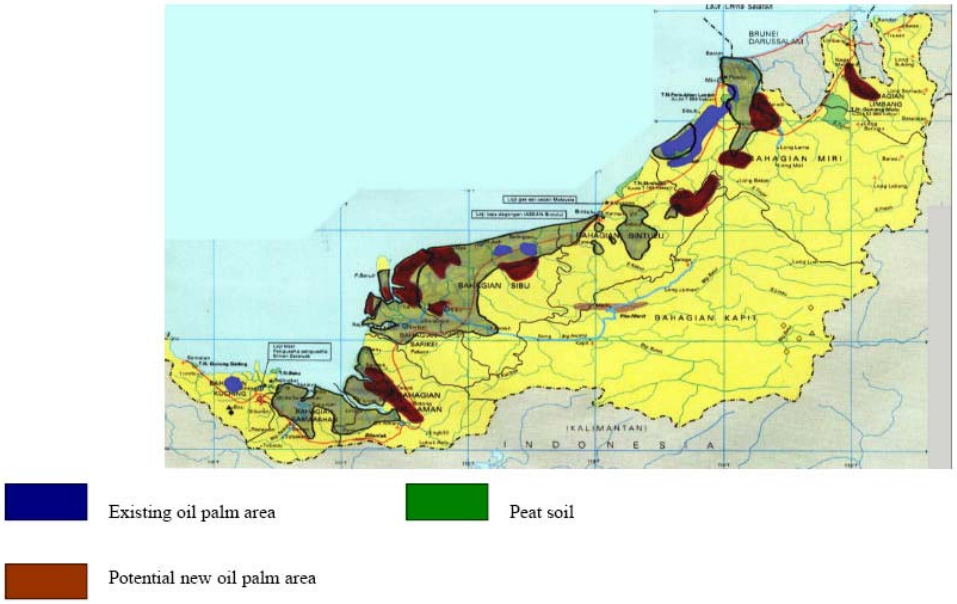


Figure 9.8: Existing and potential areas of oil palm plantation in Sarawak (2000)[106]

9.15.3 Although there does not appear to be spatial information for oil palm plantations in Malaysia that is freely available, the use of GIS and satellite map analysis does appear to have been put to usefor the mapping of some oil palm plantations in Malaysia[107].

9.15.4 If we were to be able to identify in spatial terms the areas of ecoregions under production, it would be difficult to separate out the UK's consumption of palm oil from this area, without evidence of a direct connection between plantations on the ground and UK imports.

9.16 Confidence

9.16.1 Defining palm oil as a commodity is a relatively easy process. There are many previous studies available that have investigated the palm oil supply chain, identified the agricultural products and the end uses. Although palm oil and its derivatives are not grouped together under a single commodity classification within the UNComtrade database, the key palm commodities are easily identifiable and data is available from both import and export partner countries, allowing for the prioritisation of countries in terms of their importance in the trade of palm and it's derivatives.

9.16.2 UNComtrade data provides a simple way of comparing imports of palm to the UK from trade partner countries. There are however inconsistencies, for example data on the trade flows of palm between Malaysia and the UK are substantially different, this is likely to be due to differences in the methods of reporting. It has not been possible to identify the reasons behind these differences as part of this assessment, but further research could help to establish the differences and to make a judgement on the accuracy of the trade data.

9.16.3 The identification of ecoregions can be achieved through the WWF/National Geographic wild world website. Information on how the G200 ecoregions are selected is available from the WWF. In terms of the source of information, the WWF can be considered as the most appropriate suppliers of global information on sensitive ecosystems, with their global presence and offices across the world. Information provided includes a broad summary of the threats as included in this assessment. It is not clear how up-to-date this information is, or what the review process for the G200 is.

9.16.4 The identification of the proportion of ecoregion within country boundary is useful when dealing with specific countries in terms of policy development and trade agreements. However, the importance of this exercise may be questionable – as, for example, deforestation in one area can potentially effect the integrity of much bigger areas of forest which may not be located within the subject country's boundary. There is an argument that there is a tipping point for mega-forest ecosystems that if reached will have far reaching effects, as opposed to local or even regional effects.

9.16.5 I Identifying the threats to ecoregions is possible through the use of the WWF ecoregions information. This is completely reliant on the WWF and may be worth discussing future development of the G200 system with them. The information as it stands is quite broad and probably sufficient for policy making. However, this data does not allow us to determine which ecoregions are experiencing the most pressure as a result of palm oil plantations, especially without any spatial data to corroborate the evidence available. Other reports do highlight specific areas that have suffered from a rise in the palm

industry over the past few years, but it is not possible to relate this directly to specific ecoregions without any geographically specific spatial data. Furthermore, the pressures exerted on ecoregions are likely to change, especially in countries such as Indonesia which is experiencing growth in several industrial and agricultural sectors.

9.16.6 Identifying land take for the commodity in question is relatively difficult. One commodity may have many different derivatives all of which are making a contribution to biodiversity impacts. The FAO do supply data for the area of land under production for a commodity within a specific country in FAOSTAT. However not all commodities are available and in some cases not all the derivatives are included. There are often in country associations / boards or commodity based round tables that may also hold data.

9.16.7 It is possible to quantify the proportion of the threat that is posed by the UK, from the share of total trade in oil palm products that can be attributed to the UK; and generally speaking threats can be classified to a level of certainty appropriate for policy making. However the trade data that allows for this is not perfect. UNComtrade is the most universal of commodity trading databases. The UN makes recommendations on how all countries should collect, document and manage their trade data. One recommendation, to which the UK does not comply, is that import data should be classified by country of origin or production. The UK is one of only 22 countries of a total of 140 countries that does not classify imports in the recommended manner. It should be noted that UK UNComtrade data do not account for illegal imports and trade. In some areas this may be significant for example the timber industry, although possibly not in the case of oil palm. Also where import partners are identified these may just be staging countries; the UK is one of only a few countries that does not identify the origin country when gathering trade data.

9.16.8 UNComtrade data provides imports / export data in monetary value and weight, this does not allow us to quantify threats in terms of land area effected, unless converted into a measure such as national hectares. Furthermore to understand fully the significance of the threat, it is necessary to understand the complete land area of the country in question, and the area of land considered to be of biodiversity value. This is possible to do with the use of GIS.

9.16.9 It is possible to identify recent trends in terms of land under production for a commodity within a specific country using FAOSTAT. However not all commodities are available and in some cases not all the derivatives are covered. Anecdotal evidence and research into future policy can be undertaken for commodities and countries in question, however this is time consuming and is unlikely to be accurate to any level of certainty. This information is essential to policy makers, so as to be able to react and minimise adverse impacts before they occur.

Future scenarios

9.16.10 It is possible to identify recent trends in terms of land under production for a commodity within a specific country using FAOSTAT. However not all commodities are available and in some cases not all the derivatives are covered. Anecdotal evidence and research into future policy can be undertaken for commodities and countries in question, however this is time consuming and is unlikely to be accurate to any level of certainty. This information is essential to policy makers, so as to be able to react and minimise adverse impacts before they occur.

Malaysia

9.16.11 However, this data available does not allow us to determine where the impacts of oil palm cultivation are occurring within Malaysia, and therefore which ecoregions are experiencing the most pressure as a result of palm oil plantations. Other reports highlight specific areas which have suffered from a rise in the palm industry over the past few years, but it is not possible to relate this information directly to specific ecoregions without any geographically specific spatial data. Furthermore, the pressures exerted on ecoregions are likely to change, especially in countries such as Indonesia which is experiencing growth in several industrial and agricultural sectors.

9.16.12 Non-spatial evidence of areas affected is often available. Spatial information (for example GIS) is much more difficult to come by. Some Agriculture and forestry departments of the country in question hold some data, whilst the United States Department of Agriculture all holds some information but not in the case of oil palm in Malaysia. Other data that may be useful is regional data that may give an impression of the most intensive activities in relation to G200 Ecoregions, this is available for Malaysia from the Malaysian Palm Oil Board.

9.16.13 Without spatial information, it has not been possible to link the threats posed by oil palm cultivation directly to any specific ecoregion. Although in the case of Malaysia, it can be said that the majority of impacts resulting from oil palm cultivation, and therefore UK trade in oil palm, will take place within G200 ecoregions as almost the whole of Malaysia is covered by G200 ecoregions.

9.16.14 Identifying UK companies operating or trading in a commodity would help to establish clearer links between UK consumption of oil palm and impacts on biodiversity within Malaysia. However, it has proven difficult to locate an exhaustive list of UK companies involved in the oil palm sector.

Indonesia

9.16.15 Considering its status as one of the two largest suppliers of palm, Indonesia has relatively little information available on areas of production for palm oil. Several studies quote the total area in Indonesia under palm plantation, although the original source of this information, and the methods by which it was obtained, are unclear. There is data available by region for the area under palm plantation, this was obtained from a report

quoting GAPKI and the Directorate General of Estate Crops, although no information was obtainable directly from these sources over the internet.

9.16.16 The data that was located through the FAO and the Indonesia Agriculture Department related to area harvested. This is not clearly defined and may not encompass the full extent of palm plantation in Indonesia, as immature crops are not likely to be harvested in the early years. Data is not available for all commodities and derivatives through FAOSTAT, which means that areas under production identified by this means may not relate to the full extent of palm production. There are often in country associations / boards or commodity based round tables that may also hold data.

9.16.17 Non-spatial evidence of where the land take occurs as a result of this commodity is often available. Spatial information (for example GIS) is much more difficult to come by. In the case of Indonesia, spatial data in the form of graphic representation or GIS maps were not found for palm plantations. There appears to have been some work done in the area of mapping palm plantations in Indonesia, but no extensive coverage has been published on the internet.

9.16.18 Although extensive data is not easily obtainable over the internet, organisations such as the Indonesian Oil Palm Commission, Indonesian Palm Oil Producers Association, the Roundtable on Sustainable Palm oil and the Indonesia Agriculture Department, may have more detailed information available if contacted directly.

9.16.19 It is difficult to locate an exhaustive list of UK companies operating or trading in a commodity. A Friends of the Earth report has identified key UK companies that import palm oil or products that include palm oil as an ingredient. This is the best evidence currently available and would appear to include most of the key players. In the changing climate, where palm oil is now featuring more and more as a biofuel, these 'key players' are likely to change, and this will have to be monitored closely in the coming years.

9.16.20 Identifying the stake in the Indonesian palm market that can be attributed to UK companies, and in identifying specific locations of crops / plantations that are linked to UK imports, is a complex process, and may not be possible at all considering that many of the key UK companies that import palm or use it in their products are unable to trace it back to the source.[108]

9.17 Links and further information

- The Palm Oil Research Institute: Website was not available at the time that this research was conducted: http://porim.gov.my
- The Malaysian Palm Oil Production Council - http://www.mpoc.org.my/main_ind_01.asp.
- World Business Council for Sustainable Development
- The Round table on sustainable palm oil - http://www.rspo.org/.

- Oil Palm World – oilpalmworld.com
- Palmoil.com

[76] RSPO (2004) Roundtable on Sustainable Palm Oil, 2004 RSPO Factsheet, Roundtable on Sustainable Palm Oil, Revised Version
[77] FAO(2002) FAO Agricultural Services Bulletin, Small-Scale Palm Oil Processing in Africa
[78] FAO Corporate Document Repository. Available from: http://www.fao.org/docrep/006/t0309e/T0309E01.htm#ch1.5
[79] Glastra, R. Wakker, E. Richert, W (2002) Oil Plantations and Deforestation in Indonesia. What Role Do Europe and Germany Play? WWF
[80] (2232 (Palm nuts and kernels), 4222 (Palm oil, fractions), 4224 (Palm kernel oil, fractions), 08138 (Oilcake and other solid residues of oil from palm nuts or kernel)
[81] Calculated form UNComtrade data for 2005 for the following commodity classification groups: 2232,4222,4224 and 08138. Some of the palm products imported into the Netherlands may potentially be processed before being exported into the UK.
[82] FoE. *The Oil for Ape Scandal: How palm oil is threatening the orang-utan*. Available from: http://www.orangutans-sos.org/docs/palm_oil_report_complete.pdf
[83] All information in this section: Threats to Ecoregion, has been taken directly from the WWF/National Geographic Wildworld Website available from: http://www.nationalgeographic.com/wildworld/global.html
[84] *Ibid*
[85] This information was obtained from a report published on the American National Institute of Oilseed Products: Indonesian Palm Oil Industry. The date of publication is unclear, although it would appear that the document was published in 2006 with data from 2005. Available from: http://www.niop.org/pdf/am_2006_materials/Bangun_Text.pdf
[86] Of a total 1847033Km^2
[87] University College of London Department of Geography. Available from: http://www.geog.ucl.ac.uk/~izzawati/landsat.html & Wageningen University (WUR) based in the Netherlands. Available from: http://www.sarvision.com/main.php?sn=side_nav.php?id=11&ct=monitoring/midresmon.php
[88] Source: FAOSTAT
[89]Casson (2000) the Hesitant Boom: Indonesia's oil palm sub sector in an era of economical crisis and political change, Centre for International Forestry Research
[90] Casson (2000) the Hesitant Boom: Indonesia's oil palm sub sector in an era of economical crisis and political change, Centre for International Forestry Research
[91] The State of the Forest: Indonesia FWI/WRI 2002
[92] Source: GAPKI and Directorate General of Estate Crops, in Bangun, D (2006) Indonesian Palm Oil Industry. Available from: http://www.niop.org/pdf/am_2006_materials/Bangun_Text.pdf
[93] Badan Planologi (1999) Available from: http://www.wwf.or.id/attachments/pdf/WWF%20Paper-Realising%20Sust%20Palm%20Oil%20-%20International%20OP%20Conf%202006.pdf
[94] [94] University College of London Department of Geography. Available from: http://www.geog.ucl.ac.uk/~izzawati/landsat.html & Wageningen University (WUR) based in the Netherlands. Available from: http://www.sarvision.com/main.php?sn=side_nav.php?id=11&ct=monitoring/midresmon.php
[95] Palm plantations can usually be categorised as smallholder, government, or estates. Palm estates by no means account for all palm plantations.
[96] Source: WWF

[97] Source: WRI
[98] (From aggregated data for the following commodity classifications: 2232 (Palm nuts and kernels), 4222 (Palm oil, fractions), 4224 (Palm kernel oil, fractions), 08138 (Oilcake and other solid residues of oil from palm nuts or kernel))
[99] Calculated form UNComtrade data for 2005 for the following commodity classification groups: 2232,4222,4224 and 08138. Some of the palm products imported into the Netherlands may potentially be processed before being exported into the UK.
[100] Calculated form UNComtrade data for 2005 for the following commodity classification groups: 2232,4222,4224 and 08138. Some of the palm products imported into the Netherlands may potentially be processed before being exported into the UK.
[101] Information on the criteria for selection of the G200 is available at http://www.worldwildlife.org/science/ecoregions/g200.cfm
[102] All information inn this section: Threats to Ecoregion, has been taken directly from the WWF/National Geographic Wildworld Website - http://www.nationalgeographic.com/wildworld/global.html
[103] Source: FAOSTAT
[104] Compared to 343,980 Ha in Peninsular Malaysia, and 406,421 in Sarawak.
[105] WWF (2000) *Land Use and the Oil Palm Industry in Malaysia*. Available from: http://assets.panda.org/downloads/oplanduseabridged.pdf
[106] *Ibid*
[107] Armin Gfroerer Kerstan, Thomas Fairhurst, Ian Rankine. *Use of GIS for Oil Palm Agronomy Data Analysis* . Available from: http://gis.esri.com/library/userconf/proc03/abstracts/a1018.pdf & World Rainforest Movement. Indonesia: Palming the forest. Available from: http://www.wrm.org.uy/bulletin/85/Indonesia.html , http://www.malaysiagis.com/gis_in_malaysia/forum/index.cfm?pr=printtopic&frmid=2&tpcid=253 , http://palmoilis.mpob.gov.my/publications/TOT/TT-255.pdf
[108] FoE. *The Oil for Ape Scandal: How palm oil is threatening the orang-utan*. Available from: http://www.orangutans-sos.org/docs/palm_oil_report_complete.pdf

10 Russia and Lumber

10.1 Define commodity

10.1.1 Lumber is the name used, generally in North America, for wood that has been cut into boards, planks, or other shapes for the purpose of woodworking or construction.

10.1.2 Forest products including coniferous lumber represent major UK commodity imports with potentially significant environmental and social impacts depending on the location from which they are sourced and the manner of their production. According to UN UNComtrade, the UK imported (USD)1.7bn of coniferous lumber in 2005. Of this, (USD)150,968,805 came from the Russian Federation making it the UK's fourth biggest import partner (following Sweden, Finland and Latvia).

10.1.3 Coniferous (softwood) lumber is widely used in residential and commercial construction in the UK. It is also used to manufacture products including windows, doors, decorative mouldings, furniture, shipping boxes, pallets, railway ties, bridge timbers, decking and artistic products. By-products of softwood milling such as sawdust and wood chips are used to produce engineered materials including multi-density fibreboard, particle board, oriented strand board and glue laminated beams. Wood chips and pulp grade logs are also used to produce pulp and subsequently paper products.

10.1.4 Illegal timber from Russia imported to the UK is seen as a significant problem. A recent report by WWF found that the UK is Europe's largest and the world's third-largest importer of illegally harvested or traded timber and wood products[109]. According to WWF, the majority of this illegal trade (around 2.8 million cubic metres) comes through – originates from – Sweden, Finland, **Russia**, Estonia and Latvia (the tropical countries of Brazil, Indonesia, Malaysia and central and west Africa) account for a much smaller volume). In relation to Russia, the World Bank estimated that illegal logging accounted for 25% of the country's exports[110].

10.2 Commodity Conditions

10.2.1 The taiga or boreal forest exists as a nearly continuous belt of coniferous trees across North America and Eurasia between 50 and 60 degrees north latitudes with around two thirds found in Siberia and the remainder in Scandinavia, Alaska and Canada. The taiga corresponds with regions of sub-Arctic and cold continental climate with long, severe winters and short summers and a wide range of temperatures between the winter lows and summer highs. Needleleaf, coniferous (gymnosperm) trees are the dominant plants of the taiga biome and species from four main genera are found: evergreen spruce, fir, pine and the deciduous larch.

10.3 Country Prioritisation

10.3.1 Country prioritisation is based on two main criteria, its selection as an SDD country, and its importance to the UK as a trade partner for a specific commodity. Table 10.1 below provides information on the UK's top import partners, and the global quantities attributable to the UK. From this we can see that Russia, a potential SDD country comes out as the fourth biggest import partner to the UK for coniferous lumber.

Table 10.1: Top five import partners of coniferous lumber to the UK[111]

Partner	Trade Value (USD)	Net Weight (tonnes)
Sweden	$634,217,098	1,391,674
Finland	$309,286,701	648,924
Latvia	$282,724,926	782,229
Russian Federation	$150,968,805	497,783
Estonia	$61,777,473	181,685

10.4 Identification of Ecoregions

10.4.1 The ecoregions for Russia are easily identified through the WWF global ecoregions project. However, of more interest are the G200 ecoregions that have been identified as particularly valuable in regard to biodiversity. A table is provided below giving the area for each ecoregion in km^2.

Table 10.2: Freshwater and terrestrial G200 Ecoregions in Russia

Freshwater G200	Gross Area (km^2)	Net area in country (km^2)
Lake Baikal	123088.81	123088.81
Lena River Delta	30687.87	27735.86
Russian Far East Rivers & Wetlands	2519174.53	2015094.45
Volga River Delta	86183.18	70404.34
Terrestrial G200	**Gross Area (km^2)**	**Net area in country (km^2)**
Ural Mountains Taiga and Tundra	174495.63	174495.63
Altai-Sayan Montane Forests	848,121.46	487,327.73
Caucasus-Anatolian-Hyrcanian Temperate Forests	339,907.08	57,822.09
Central and Eastern Siberian Taiga	3905660.01	3905001.45
Chukhote Coastal Tundra	305437.91	299844.85
Daurian/Mongolian Steppe	1,096,916.50	114,566.28
European-Mediterranean Montane Forests	22,496.24	22,295.57
Fenno-Scandia Alpine Tundra and Taiga	188,047.73	52,103.83

Kamchatka Taiga and Grasslands	279,660.37	273,070.33
Russian Far East Broadleaf and Mixed Forests	209,387.46	205,825.59
Taimyr and Russian Coastal Tundra	1,169,754.17	1,142,904.65

10.5 Threats to these ecoregions

Lake Baikal

10.5.1 Although industrial development is significant, natural habitats are not as highly fragmented as in other regions of Russia. Major threats stem from industrial pollution, forest clearance, fires, agriculture, and grazing.

Lena River Delta

10.5.2 The Lena Delta Reserve was expanded in 1995, making it the largest protected area in Russia (61,000 km^2). However, overfishing, particularly of Cisco populations is a concern. Outside of the reserve, mining, forestry, grazing, expanding agricultural activities, water diversion for irrigation, and pollution from fertilizers and pesticides may threaten the water quality and quantity that reaches the delta.

Russian Far East Rivers & Wetlands

10.5.3 Fishing pressure in parts of this ecoregion is intense, including poaching of salmon on breeding grounds for roe, and drift netting for salmon in international waters. In addition to damaging activities such as mining and logging, oil and gas drilling threaten fish habitat through dumping of drilling mud and the potential of oil spills.

Volga River Delta

10.5.4 Dams upstream have altered the natural flow regime of the river thus negatively affecting the productivity of the delta and its fauna. Planned impoundments, water diversions, industrial, agricultural, and domestic pollution further threaten the health of populations dependent upon the delta ecosystem. Cyanobacterial blooms and deoxygentation have increased in recent years.

Ural Mountains Taiga and Tundra

10.5.5 Centuries of resource exploitation, logging, mining, processing of metals and chemicals, and heavy industry have caused extensive habitat loss and degradation in some locations.

Altai-Sayan Montane Forests

10.5.6 Forest clearance, plant over collection and hunting occur along the banks of larger rivers and in heavily populated areas such as the Kusnetsk Basin, Salair, Alatau Kuznetsk and southwestern Altai. Extensive wildfires have been known to engulf huge amounts of

forest while mining is a threat in some locations. In addition, alpine and sub alpine areas suffer from overgrazing and associated erosion.

Caucasus-Anatolian-Hyrcanian Temperate Forests

10.5.7 Aggressive forestry techniques including clear felling and replanting with alien species, coastal development in narrow coastal strips, overgrazing, recreation, and dam construction in large and small catchments, threaten the integrity of this ecoregion. An international consortium, BTC Co., headed by BP, are proposing to build a 1700km pipeline to convey Caspian crude oil from Baku in Azerbaijan to Ceyhan on the Turkish coast of the Mediterranean. Preliminary construction work for the project commenced in 2003. Without proper planning, such projects could have a devastating impact on the biodiversity of the ecoregion.

Central and Eastern Siberian Taiga

10.5.8 Coal mining, logging, pollution, oil and gas development all pose threats. Several major hydroelectric projects are also planned for the region.

Chukhote Coastal Tundra

10.5.9 Industrial development, climate change, and lack of protected areas constitute threats. Increasing exploitation of wildlife is another area of concern, for instance the growing demand for eggs of rare birds by collectors now threatens several endangered species.

Daurian / Mongolian Steppe

10.5.10 Overgrazing, agricultural fragmentation, mining, oil exploitation and extraction, and infrastructure development are among the most serious threats in this region. Most of these threats are concentrated along the Trans-Siberian railroad.

European-Mediterranean Montane Forests

10.5.11 Logging, overgrazing, air pollution, acid rain, poaching, predator control, and industrial development pose the greatest threats to this ecoregion. In addition, the expansion of towns and villages, trans-alpine communication systems, and tourism pose additional threats to the integrity of habitats.

Fenno-Scandia Alpine Tundra and Taiga

10.5.12 Petroleum development, overgrazing, logging and tourism all have negative effects in this ecoregion. Radioactive fallout from Chernobyl is still found in lichens and continues to harm wildlife and people. Additionally, climate change could increasingly threaten the integrity of habitats. On the positive side - the ecoregion includes a large number of protected areas that are linked across international boundaries and the inaccessibility offers additional protection to rare plants and larger predators.

Kamchatka Taiga and Grasslands

10.5.13 Habitats in this region are relatively intact and ndeveloped due to low human population density. However, big-game hunting and poaching of brown bears threaten one of the world's most intact populations of this species.

Russian Far East Broadleaf and Mixed Forests

10.5.14 Conversion to agriculture, deforestation, poaching, urban expansion, mining, and pollution pose serious threats to the ecoregion.

Taimyr and Russian Coastal Tundra

10.5.15 While much of the Arctic remains intact, mining, heavy industry, nuclear power plants, climate change, and air pollution threaten the ecoregion.

10.6 Confidence

10.6.1 What we can be very confident of is the identification of the G200 ecoregions and their total area within the country. The information is robust, transparent and reliable (WWF to provide information on updates monitoring etc), however, it is wholly dependant on the reliability of WWF (an NGO) data.

10.7 Area of commodity production

10.7.1 In order to try and follow Russian imports back to a specific geographical area, we need to know A) the area under cultivation for UK consumption and B) the location of this area in regard to the country and to ecoregions and G200 ecoregions.

10.7.2 Sweden and Finland both import large quantities of materials from the Baltic States and north-west Russia to supplement their own domestically grown timber. Imports for these two countries amounted to almost 19 million cubic metres in 2003. These imports include material from Russia, Latvia and Estonia, three of the countries recognised as significant players with respect to illegal logging[112]. WWF estimates that over 3% of Swedish and over 7% of Finnish exports contain illegal wood.

10.7.3 According to the World Bank, 25% of Russian timber exports are illegal[113]. In terms of production itself, the IUCN has estimated that **20 – 60 %** of production is illegal[114].

10.7.4 According to a report by WWF, most Russian forest products destined for export to Europe originate in the north west of European Russia[115]. This region consists of: Arkhangelskaya Oblast (including Nenets Autonomous District), St.Petersburg and Leningradskaya Oblast, Murmanskaya Oblast, Novgorodskaya Oblast, Pskovskaya Oblast, Vologodskaya Oblast, and Republics of Karelia and Komi (Fig. 10.1).

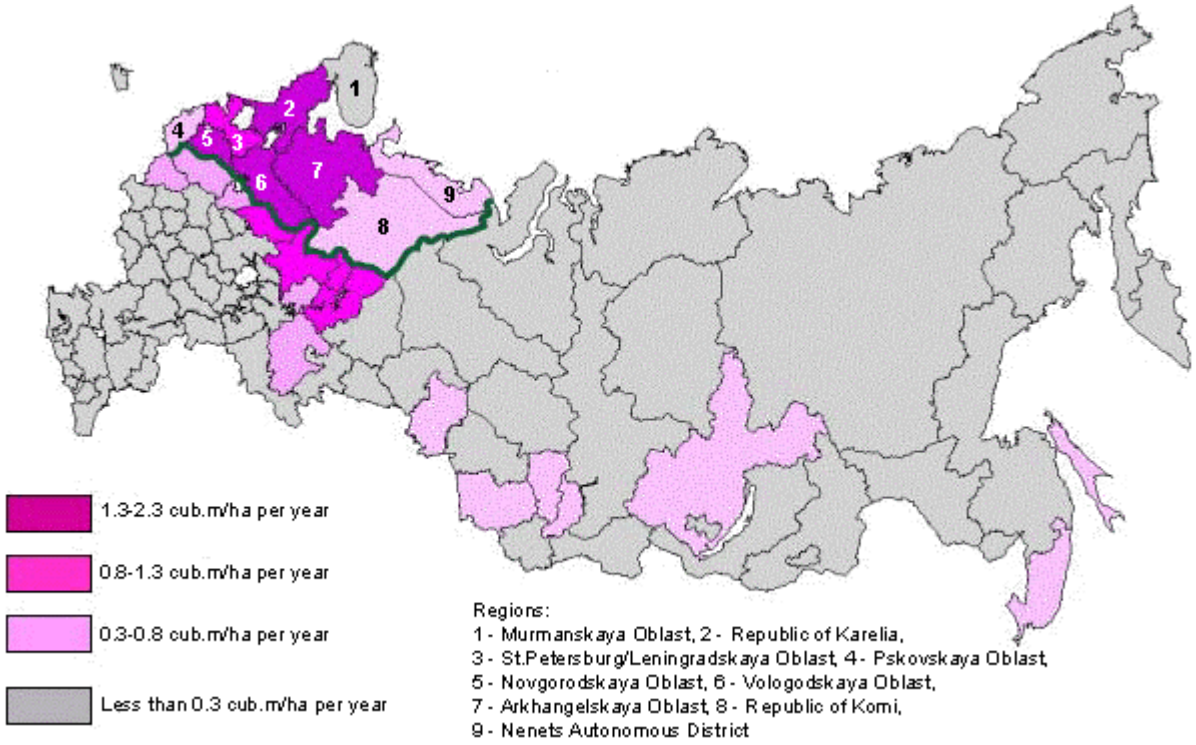


Figure 10.1: Regions of northwestern Russia. Intensity of wood harvesting in Russia (estimates)

10.7.5 According to the WWF report, northwestern Russia is characterised by the most intensive wood harvesting in the country. At the same time, it is rich in forest, which covers about 70 % of the area. Coniferous species, including mostly Scots pine and Norway spruce, account for about 50% of the forest area with aspen and birch also widespread. The report emphasises that the majority of forest in northwestern Russia is still close to a natural state and the intensity of forest management is much lower than in neighbouring Finland and Sweden (Figure 10.2).

10.7.6 In terms of intact forest, European Russia is the most affected with only 9 percent intact according to the World Resources Institute (WRI)[116]. According to the WRI, Nenets Autonomous District has 100% of its forest cover intact (9 in Figure 10.1).

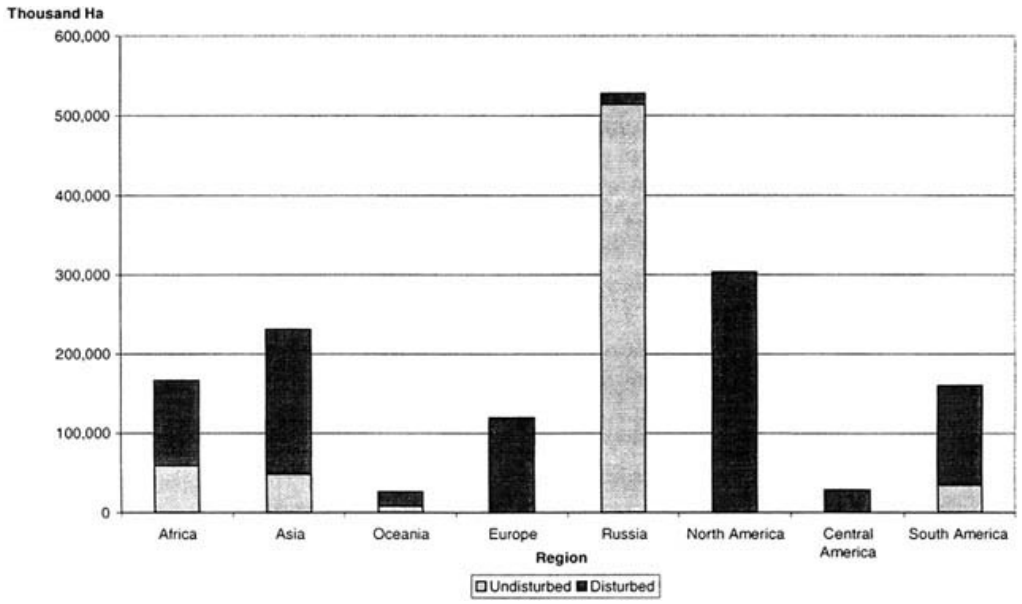


Figure 10.2: Distribution of natural forests available for harvesting by condition and region[117]

10.8 Links and further information

[109] WWF (2007). *Illegal Logging: Cut it Out*. Available from: http://www.wwf.or.jp/activity/forest/lib/IllegalLoggingUK200701f.pdf

[110] World Bank (2005). *Forest Law Enforcement Governance (FLEG) in Eastern Europe and Northern Asia (ENA-FLEG)*, page 8.

[111] Source: UNComtrade

[112] WWF (2007). *Illegal Logging: Cut it Out*. Available from: http://www.wwf.or.jp/activity/forest/lib/IllegalLoggingUK200701f.pdf

[113] World Bank (2005). *Forest Law Enforcement Governance (FLEG) in Eastern Europe and Northern Asia (ENA-FLEG)*, page 8.

[114] IUCN Global Temperate and Boreal Forest Programme IUCN Office for Russia and the Commonwealth of Independent States, 2005, *The Beginning of the ENA FLEG Process in Russia: Civil Society Insights*. p. 21. Available from: http://research.yale.edu/gisf/assets/pdf/tfd/logging/ENA%20FLEG/ENA%20FLEG_CivilSociety%20INsights.pdf

[115] WWF (2003). Illegal Logging in Northwestern Russia and Export of Russian Forest Products to Sweden. Available from:http://assets.panda.org/downloads/illegloggingswedenrussia.doc

[116] WRI. Available from: http://www.wri.org/biodiv/pubs_description.cfm?pid=3717

[117] FAO. Available from: http://www.fao.org/docrep/004/ac127e/ac127e02.htm

11 South Africa and Wine

11.1 Define commodity

11.1.1 Wine is classified under the Harmonised System (HS) commodity classification to include both red and white still wines, sparkling and fortified wines. It is straightforward to classify. It is imported to the UK either already bottled or in bulk, for bottling in the UK.

11.1.2 In 2005 the UK imported 1.2bn litres of wine, at a cost of (USD)4.2bn. Table 11.1 and Table 11.2 show, by quantity and value respectively, the countries from which the UK imported the greatest amount of wine in 2005.

11.1.3 As the unit value of wine varies considerably it is sensible to focus primarily on the quantity imported when trying to ascertain the relative biodiversity impacts of these imports to the source country.

Table 11.1: UK wine import partners in 2005, by quantity [118]

Rank	Country	Quantity (litres)
1	Australia	263,330,711
2	France	251,331,998
3	Italy	158,025,531
4	Spain	128,451,631
5	USA	109,114,568
6	Germany	99,032,492
7	South Africa	98,910,436
8	Chile	80,993,056
9	Portugal	38,592,438
10	Argentina	23,945,041
11	New Zealand	23,482,780
12	Netherlands	4,800,206

Table 11.2: UK wine import partners in 2005, by trade value [119]

Rank	Country	Value (USD)
1	France	1,424,119,939
2	Australia	870,953,683
3	Italy	454,915,920
4	Spain	298,855,031
5	USA	239,006,600
6	South Africa	230,739,377
7	Chile	196,986,821
8	Germany	189,234,589
9	New Zealand	142,976,566
10	Portugal	83,585,520
11	Argentina	50,428,914

12	Netherlands	15,323,933

11.2 Commodity Conditions

11.2.1 Wine grapes grow almost exclusively between thirty and fifty degrees north or south of the equator (see Figure 11.1). Beyond these limits, the climate is either too cool to ripen the grapes or too hot to produce quality wine. As a rule, grapevines prefer a relatively long growing season of 100 days or more with warm daytime temperatures (not above 95°F/35°C) and cool nights (a difference of 40°F/23°C or more).[120] Climate change may see some changes in where wine can be grown successfully.

11.2.2 The 'terroir' or unique growing conditions of a vineyard are seen as important to growing wines. In South Africa, the characteristically sandy, nutrient-poor soils of fynbos and Renosterveld are ideally suited to growing vines, as is the Mediterranean type climate of the Cape and the mountain slopes and valleys of the region.

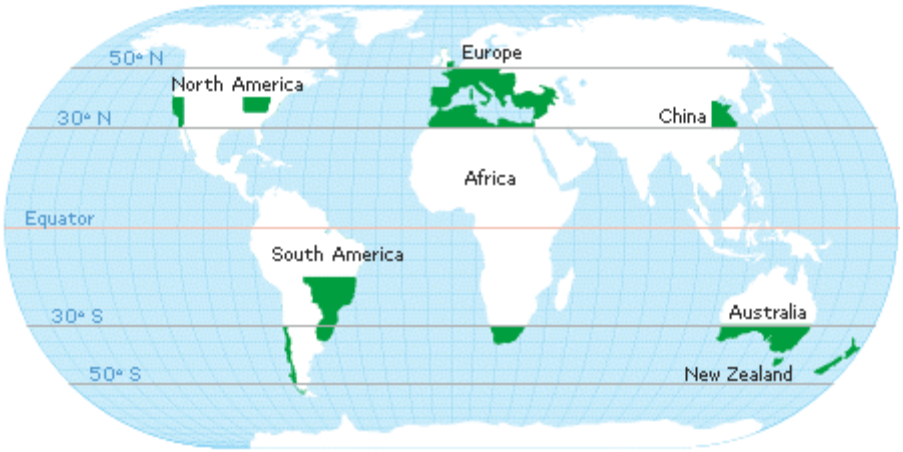


Figure 11.1: Wine growing regions of the world[121]

11.3 Country Prioritisation

11.3.1 Country prioritisation is based on two main criteria, its selection as an SDD country, and its importance to the UK as a trade partner for a specific commodity. Of the UK's major import partners listed in Table 11.1, only Chile, Argentina and South Africa are not OECD member countries. Of these 3 nations only South Africa is a Sustainable Development Dialogue (SDD) country with the UK. South Africa ranked 7th as an import partner with the UK for wine by volume and 6th for wine by value. Looking from the other side of the trade relationship, the UK is by far South Africa's largest export market, double the size of Germany's in second place[122].

11.4 Identification of Ecoregions

11.4.1 The ecoregions for South Africa are easily identified through the WWF global ecoregions project. However, of more interest are the G200 ecoregions that have been identified as particularly valuable in regard to biodiversity. The ecoregions present in South Africa include terrestrial, freshwater and marine.

11.5 Threats to these ecoregions

11.5.1 Threats to the three G200 terrestrial ecoregions and one freshwater ecoregion which include coverage within South Africa were assessed according to the main drivers of biodiversity loss highlighted by the Millennium Ecosystem Assessment.

The Namib-Karoo-Kaokoveld Deserts

11.5.2 The Namib-Karoo-Kaokoveld Deserts suffer from poor land management which has resulted in the conversion of fragile land for cattle, goat, ostrich, and sheep ranching. Mining for minerals also affects the land and causes pollution. Furthermore, some succulent plants are collected and sold illegally.

Fynbos Ecoregion

11.5.3 In the Fynbos Ecoregion natural vegetation has been destroyed to make room for agriculture and cities, especially in the lowlands. Fynbos (an Afrikaans word for 'fine bush') is a shrubland comprising hard-leafed, evergreen and fire-prone shrubs that thrive on the region's rocky or sandy nutrient-poor soil. Although the region was once covered by lush rain forest, climate changes around 15 million years ago resulted in the retreat of the forests. Trees were replaced by flammable sclerophyllous plants, and periodic fires became an integral ecosystem process. Fire is now often controlled to protect houses and other property. This changes natural conditions that many species need to survive. People have brought many species to the Fynbos from other areas that compete with native inhabitants for food and habitat. The presence of alien plants has changed natural communities and threatened many plant and animal species.

11.5.4 The Cape of South Africa, part of which is covered by the Fynbos ecoregion, also includes several non-fynbos vegetation types. Of these, Renosterveld (Afrikaans for "rhinoceros veld," referring to the presence of the black rhinoceros (Diceros bicornis), that used to browse there but is now extinct in this region) is the most extensive, covering some 20 000 km². This plant community comprises a low shrub layer, usually dominated by the renosterbos (Elytropappus rhinocerotis), with a ground layer of grasses and seasonally active bulbs.

Drakensburg Montane Woodlands and Grasslands

11.5.5 Threats to this ecoregion include agriculture, overgrazing, uncontrolled burning, bark-stripping of medicinal trees, soil erosion, firewood collection, and invasive plants.

However, the planting of exotic trees is one of the most critical threats. The current status of conservation protection is good compared to most areas in Africa. Almost the entire Drakensberg range is protected, and a number of other areas within the ecoregion have some level of protection.

Cape Rivers and Streams

11.5.6 Lying mainly within the Fynbos ecoregion the Cape Rivers and Streams are known for supporting a highly distinctive aquatic biota, exhibiting high levels of endemism. Water is in great demand in this dry ecoregion for both urban and agricultural uses, which leads to competition with the needs of the unique aquatic fauna, as well as causing pollution. The construction of dams and interbasin water transfers have altered the natural flow regime and blocked species movements. Introduced species, particularly North American gamefishes such as Largemouth bass (*Micropterus salmoides*) and Smallmouth bass (*M. dolomieu*) have heavily impacted indigenous species

Threats specific to wine production

11.5.7 The Biodiversity Guidelines form a part of the South African wine industry's Integrated Production of Wine (IPW) technical system of sustainable wine production[123]. These guidelines identify a range of measures to be taken by wine growers to minimise impact on biodiversity and to positively protect biodiversity. Key areas of potential impacts on biodiversity identified in the guidelines include:

- Threatened ecosystems – new vineyards created on virgin soil with pristine natural vegetation pose a threat to ecosystems
- Rivers & wetlands - water abstraction, dams and damage to riparian habitat are all threats to rivers and wetlands
- Invasive alien plants have a significant negative impact on the environment by causing direct habitat destruction, increasing the risk and intensity of wildfires, and reducing surface and sub surface water.
- Fire Management
- General land and vineyard management: When large, continuous areas of habitat are broken up into disconnected fragments, many ecological processes that keep these systems functioning are disrupted and many species disappear. Corridors of natural habitats are needed to link fragments to allow species movement, pollination and nesting to continue.
- Soil erosion
- Fertilizer run-off
- Pesticide drift
- Waste management

11.6 Other classifications of biodiversity

11.6.1 WWF's Ecoregions are not the only international form of classification for biodiversity. Other models include World Heritage Sites and Conservation International's biodiversity hotspots.

11.6.2 Within South Africa, there are three biodiversity hotspots, as classified by Conservation International. These are the Cape Floristic Region, Maputaland – Pondoland – Albany and Succulent Karoo hotspots. The Cape Floristic Region is also recognized as a World Heritage Site, referred to as the Cape Floral Kingdom (CFK).

11.6.3 The Cape Floristic Region largely overlaps with the Fynbos ecoregion. The Succulent Karoo hotspot is a small part of the more extensive Namib-Karoo-Kaokoveld Deserts ecoregion. The Maputaland – Pondoland – Albany hotspot and the Drakensburg Montane Woodlands and Grasslands hotspot largely overlap.

11.6.4 The Biodiversity & Wine Initiative (BWI) is an example of a partnership initiative between the South African wine industry and the conservation sector to minimise the further loss of threatened natural habitat, and to contribute to sustainable wine production, through the adoption of biodiversity guidelines by the South African wine industry. It is based around the fact that approximately 90% of SA wine production occurs within the CFK, and therefore concern that valuable habitat may be put at risk by further vineyard expansion.

11.6.5 The wine industry benefits from leveraging the biodiversity of the CFK as a competitive marketing advantage, and from using the BWI as a tool to achieve sustainable natural resource management, which is seen as being closely related to the distinctive terroir of SA wine. This approach has been challenged by UK restaurateurs and sommeliers who criticize the marketing campaign: *"What has the Cape Floral Kingdom got to do with wine? We drove through regions where vines are a monoculture…".* [124]

11.7 Area of commodity production

11.7.1 In order to trace UK wine imports back to a specific geographical area, we need to know the area under cultivation for UK consumption and the location of this area in the country and in relation to ecoregions and G200 ecoregions.

11.7.2 In 2005, wine grapes were grown on 101,607 hectares of land in South Africa, an increase of 1.4% from 2004125. The area under wine grapes has increased constantly from 1990. In 2005, 3,654 hectares were planted while 3,814 hectares were uprooted. Trends from 1990 to 1995 showed new plantings and uprootings of vines were in balance with each other. Industry projections up to 2011 show a general balance between plantings and uprootings, indicating no significant change in the area of wine grape production over the next 4-5 years126.

11.7.3 More detailed information is held by industry information sources showing plantings by wine region.

11.8 Location of Commodity Production

11.8.1 The wine export industry body Wines of South Africa produces a map showing the regions in which wine grapes are grown. It is predominantly around the Cape region of South Africa.

11.8.2 Detailed information is held by industry information sources showing areas newly planted to wine grapes and vines uprooted by wine region. Industry sources also hold data on actual hectares of wine grape vines by region. However, publically available information factsheets tend to only show % of total breakdowns by grape variety or grape age, catering to the needs of wine industry commentators who are less interested in actual figures in hectares.

11.8.3 It is possible to get up-to-date and reliable data on wine trade between UK and South Africa. Industry publications use data from major, reputable, marketing information companies to identify the major wine brands sold in the UK. It should be noted that the identification of the companies involved in the export and sale of South African wine requires tracing of the brand ownership, which can change quite rapidly, as the global wine business becomes concentrated into a smaller number of large multinational companies. For example, Kumala, the leading brand, changed owners in less than two years from Western Wines to Canadian-owned Vincor to US-owned Constellation[127]. Specialist annually updated wine publications keep track of the ownership of wine businesses, so it is possible to identify the corporations involved.

11.8.4 Figure 11.2 demonstrates how just three major brands – Kumala, Namaqua and FirstCape - account for nearly half of all off-trade sales of South African wine in the UK. Off-trade refers to alcohol bought for consumption not on the premises, so this mostly refers to wine bought in supermarkets and other retail outlets, rather than wine bought in bars or restaurants. Market analysis highlights the power of the UK supermarkets to influence sales of wines and thus imports of wine from South Africa.

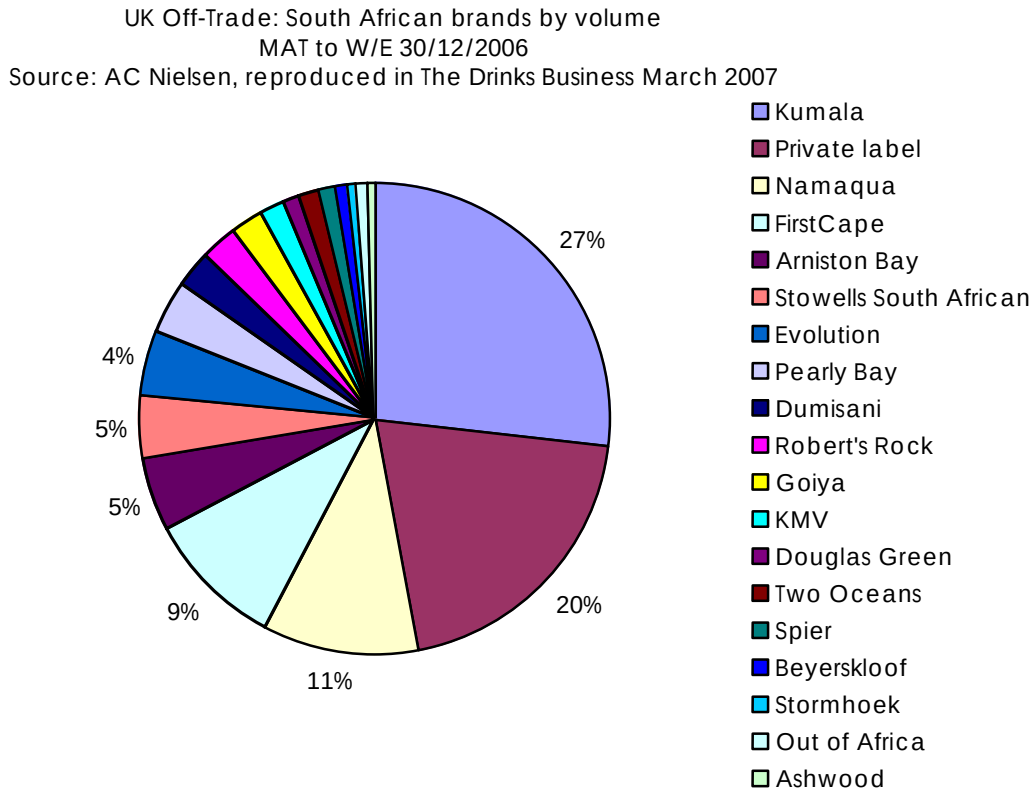


Figure 11.2: Comparing South African brands significance in the UK[128]

11.9 Commodity Production within G200 Ecoregions

11.9.1 The above allows us to determine that the the Fynbos ecoregion and Namib-Karoo-Kaokoveld Deserts as well as the Cape Rivers and Streams freshwater ecoregion have a high proportion of land area under cultivation for wine (above 50%).

11.9.2 The Biodiversity Wine initiative estimates that 90% of wine production is within the Cape Floral Kingdom[129], identified as a Global Biodiversity Hotspot[130] and South Africa's newest World Heritage site. The Cape Floral Kingdom largely corresponds with the Fynbos ecoregion.

11.9.3 The United Kingdom accounted for approximately 30% of packaged and bulk natural wine exports from South Africa in 2006/2007[131]. The main brands sold in the UK are Kumala, Namaqua and FirstCape. UK supermarkets are major buyers of South African wines and are more readily identifiable actors than the brands, whose ownership moves between multinational companies relatively quickly.

11.10 Confidence

11.10.1 We can be confident of **the identification of the G200 ecoregions and their total area within the country**. The information is robust, transparent and reliable (WWF to provide information on updates monitoring etc). It is also available in a data format useable in GIS or marine, freshwater and terrestrial ecosystems. However, the data relating to the ecoregions is wholly dependant on the reliability of WWF (an NGO) data. Furthermore, it is unclear as to when the data relating to the ecoregions was last up dated. Threats and species composition is likely to alter over time and it is important that policy making decisions are made on the basis of the most up to date data available. In country departments of the WWF and other NGOs may hold some more up to date information relating to biodiversity impacts.

11.10.2 The use of Global Biodiversity Hotspots or World Heritage sites may have been more useful for this case study, since the South African wine industry itself has an initiative on biodiversity that specifically relates to the Cape Floristic region, in which 90% of wine production takes places. However, this country- and commodity-specific reason may not apply to wine grape production in other countries or indeed to other commodities. The methodology should be able to adapt to use the most appropriate system for identifying sites of biodiversity importance. In some cases, use of national identification systems may be more appropriate for gaining leverage in negotiations with partner country governments, who may not recognise the legitimacy of international NGO based classifications.

11.10.3 We have to rely on informed assumptions to draw conclusions about the specific threats to ecoregions from wine production per se, due to a relative paucity of documented evidence. Most available evidence refers to agriculture generally and is often more specific in its details about threats from livestock rearing or other forms of cultivated crops. Industry specific guidelines on measures to protect biodiversity provide a pointer to the kinds of threats to the ecoregion and the biodiversity within it, but do not provide detailed evidence of the damage to date or the threat, since their focus is on practical steps for landowners or growers to take to protect biodiversity.

11.10.4 Using available data, it is possible to develop a methodology to quantify land-take threats from wine production by using industry data on land used for wine production and new plantings of wine grapes. Data is available on new plantings of vine by wine region, providing some specificity of where any potential land take for wine production is occuring. This information is based on surveys returned by individual land-owners, so theoretically it should be able to undertake precise analysis of where new land take is occurring. However, it is unlikely that data below regional level would be made available to third parties. An additional challenge is how to ascertain how much of this land is virgin land and how much is old agricultural lands.

11.10.5 We can be confident that industry data on exports and on wine sales by brand in the UK. Industry produced figures are subject to scrutiny by market analysts. Additionally

reputable global market information companies provide an alternative way of gathering data, although their sources are likely to be industry bodies.

11.11 Future scenarios

11.11.1 The IPW biodiversity guidelines[132] state that new vineyards should ideally be developed on old agricultural lands and not on virgin soil with pristine natural vegetation. A ploughing permit must first be obtained from the National Department of Agriculture in order to develop virgin soil. Any land that has not been worked for more than 10 years is regarded as virgin ground. As of 2006, the removal of any natural vegetation comprising an area of 3 ha or more requires authorisation from the Provincial Department of Environmental Affairs. Given the already highly fragmented nature of pristine natural vegetation in the Fynbos ecoregion, the laws to protect natural vegetation it is unlikely that there will be significant further land take as a result of wine. Industry projections over the short term indicate new plantings and uprootings largely balanced.

11.11.2 The South African wine industry saw a fall in exports of 11% in volume and value in the UK market in 2006.[133] Industry press coverage has criticised the South African wine industry for 'bottom-feeding', by producing high volumes of low quality wine for the low value end of the export industry. A recent market analysis article showed that just less than 75% of UK off-trade sales of South African wines are for bottles retailing at £4 and under. This compares with 64% of total UK off-trade sales by price band[134]. The low-end of the market is based on extensive vineyards to produce high volumes of wine, by contrast with the 'premium' end of the wine market producing lower volumes of wine. Historically, a solution taken by governments to over-production of low quality wine and slumps in wine sales have been to pay farmers to rip up vineyards. This approach has been adopted in the past in France's Languedoc region and more recently, in Chile[135]. Industry reports indicate that farmers in South Africa have ripped up some vineyards in the wake of the recent slump. It is possible that the government might encourage further ripping up of vineyards, in order to support the industry's wider recovery. However, in South Africa, the benefits to biodiversity within ecoregions of ripping up vineyards would only be felt if the area was allowed to return to natural vegetation rather than being replanted to other vine varieties or switched to other forms of intensive agriculture.

11.12 Conclusions

11.12.1 The case study demonstrates a tangible relationship between areas of wine grape cultivation and areas of high biodiversity value in South Africa. Graphical availability of data showing area of cultivation is the only area not performing well. This is because available maps show wine regions, within which some areas will not be under cultivation for wine. Unlike other agricultural products, mapping of wine grape cultivation is not undertaken by FAO. However, the 'visibility' of wine as a specialist consumer commodity, whose value is strongly linked to where it comes from, means that maps can be obtained from a range of sources and compared for consistency.

11.13 So what does this tell us?

11.13.1 There can be a high degree of confidence in figures given for areas of vine cultivation. This includes precise figures for areas newly planted. However, biodiversity impacts associated with these figures will be uncertain as long as it is unknown whether newly planted land is likely to be valued habitat or recently farmed land. Similarly, there is a relative scarcity of research on biodiversity impacts specific to vine cultivation in comparison to the farming of other major commodities.

11.13.2 Accurate spatial data showing precisely where wine is being grown is more difficult to attain as figures for vine cultivation are collated by industry bodies that are less concerned with patterns of production below the wine region scale. As a result GIS datasets showing precise locations were not available.

11.13.3 It possible to get up-to-date and reliable data on wine trade between UK and South Africa, as there are no intermediate products and the country of production is always made explicit. There is also well maintained market data showing the quantities of different SA wine brands sold in the UK and so this may aid efforts to more accurately identify biodiversity impacts within SA or even within wine regions. Care must be taken when tracing brand ownership, which can change quite rapidly as the global wine business becomes concentrated into a smaller number of large multinational companies.

11.13.4 Finally, we found that the use of Global Biodiversity Hotspots or World Heritage sites may have been more useful for this case study, since the South African wine industry itself has an initiative on biodiversity that specifically relates to the Cape Floristic Region, in which it is known that 90% of wine production takes places.

11.14 Links and further information

- SAWIS (S A Wine Industry Information & Systems)
  - http://www.sawis.co.za/sawisportal/DesktopDefault.aspx?Language=0&tabindex=0&tabid=1
- Biodiversity and Wine Initiative
  - http://www.bwi.co.za/
- Wines of South Africa
  - http://www.winesofsa.com/

[118] UNComtrade

[119] UNComtrade
[120] Wine History. Available from: http://www.beer100.com/history/winehistory.htm
[121] Waitrose. Available from: http://www.waitrose.com/food_drink/waitrosewineguide/tastingwine/factorsthataffectthetasteofwine.asp
[122] 'Cape Fear: South Africa Market Analysis' *The Drinks Business* March 2007 p.36. www.thedrinksbusiness.com
[123] *Integrated Production of Wine (IPW) Scheme.* Available from: http://www.bwi.co.za/downloads/docs/Summary%20of%20biodiv%20guidelines-Feb%2006.doc
[124] 'Cape Fear: South Africa Market Analysis' *The Drinks Business* March 2007 p.36. www.thedrinksbusiness.com
[125] SAWIS, 2005, Statistics of Wine-Grape Vines: compiled from annual returns submitted by registered wine-growers. South Africa Wine Industry Information and Systems. Available from: http://www.sawis.co.za/SAWISPortal/uploads/Wine-grape%20vine%20stats2006.pdf
[126] SAWIS, 2006, Production and Market Estimates 2007 – 2011, South Africa Wine Industry Information and Systems. Available from: http://www.sawis.co.za
[127] 'Cape Fear: South African Market Analysis' in The Drinks Business Issue 56 March 2007 p 26-27. Available from: www.thedrinksbusiness.com
[128] Other individual brands, not labelled with %, each account for between 1% and 3% of total volume of sales.
[129] Biodiversity and Wine Initiative. Available from: http://www.bwi.co.za/background/
[130] Global Biodiversity Hotspots are defined by Conservation International. Available from: http://www.biodiversityhotspots.org/xp/Hotspots/
[131] SAWIS, 2006, Production and Market Estimates 2007 – 2011 SA Wine Industry Information Systems. Available from: http://www.sawis.co.za
[132] Biodiversity and Wine Initiative. Available from: http://www.bwi.co.za/downloads/docs/Summary%20of%20biodiv%20guidelines-Feb%2006.doc
[133] The Drinks Business. Available from: http://www.thedrinksbusiness.com/index.php?option=com_content&task=view&id=5684&Itemid=66
[134] *UK off-trade: sales by price band* ACNielsen, reproduced in 'Cape Fear: South African Market Analysis' in The Drinks Business Issue 56 March 2007 p 30. Available from: www.thedrinksbusiness.com
[135] See, for example, http://africa.reuters.com/commodities/news/usnN16437434.html

12 Summary and Recommendations

12.1.1 Without a doubt, tracing a commodity from end user to source is a complex and uncertain exercise. What we have attempted to achieve with this method and supporting pilot studies is to establish a series of steps that we believe will ensure the user arrives as close as possible to a robust answer as the current information allows. The key messages are:

- Brazil
  - Soya – Soya is grown in areas under *general* agricultural cultivation. The information from the USDA indicates that the land used for agriculture in Brazil is under a form of crop rotation and could at various times be classified as under cultivation for soya, corn, cotton and rice. This would leave us to conclude that there is a temporal scale to our attribution of land in addition to spatial.
  - Lumber - The investigation indicates that the UK imports relatively little lumber – either tropical or coniferous – from Brazil (Brazil being the 19th and 21st biggest importer to the UK, for each type of wood, respectively). However, there are concerns over illegal timber entering the UK as highlighted by WWF.
  - The majority of the Amazon remains intact and timber extraction is concentrated in the eastern part of Brazil (nearer the centres of population) while the western area remains relatively undisturbed. Presumably tropical lumber from Brazil entering the UK originates in these areas. According to sources, *Eucalyptus* plantations are primarily located on abandoned agricultural lands, deforestation having occurred earlier[136].
  - Besides its native forests, Brazil has established 6.2 million hectares of plantations (mostly pine and eucalyptus) in one the most 'successful reforestation program ever seen'[137]. According to Conservation International, much of Brazil's industrial forestry operations are located in the states of Bahia, Minas Gerais and Espírito Santo in the heart of the Atlantic Forest Hotspot. Whilst there has been some reforestation, the Atlantic forest now covers less than 7% of its original area (although it still harbours a wide variety of biodiversity)[138].
  - A direct link between deforestation to make way for plantations, the products of which are then exported to countries including the UK is problematic. Additionally, the coniferous lumber coming to the UK from Brazil is presumably pine since eucalyptus is not classified as a coniferous species and exports of softwood lumber (mainly pine) have increased significantly[139]. According to the USDA Foreign Agricultural Service, Brazilian softwood plywood certified to European standards continues to be exported to the EU, where the U.K., Germany, and Belgium consume more than 47 percent of all Brazil pine softwood plywood sold abroad[140].

- Interestingly, eucalyptus is increasingly seen as a substitute for more valuable hardwoods, especially topical hardwood species. Eucalyptus may therefore form part of the UK's imports of Brazilian non-coniferous lumber (thus *lessening* the UK's impact on the Amazon). However, most eucalyptus is managed to produce pulpwood and paper (although Brail produces just over a third of all the plantation-grown *Eucalyptus* sawlogs in the world[141]). In addition, another major change in export marketing of *Eucalyptus* lumber has been the flow of lumber from producing countries (primarily, Brazil, Uruguay and South Africa) to Southeast Asian countries, for production of FSC certified garden furniture for Europe[142].

- Columbia
  - Palm Oil - it was possible to establish a reasonable confidence in the import/export values of palm oil imports to the UK from Colombia, however there is insufficient information to understand the additional imports from Colombia for palm oil from staging countries where processing and production of raw materials occurs.
  - There were a number of barriers to establishing definitive areas of palm oil production in Colombia, only the main producing provinces and production areas were available through a number of sources. Further detailed data was missing in either tabulated / mapped form, therefore missing a potentially significant proportion of unrecorded / illegal cultivation areas, whose synergistic impacts on G200 ecoregions may be significant.
  - Information from governmental sources, both nationally or provincially, was unavailable / not easily identifiable. The mapping information on cultivated areas was from Fedepalma the Colombian federation of palm oil growers, and Human Rights Everywhere (HREV) an NGO for human rights, the sources of their respective data may not be wholly representative / objective depending on the potential biases of their organisations.
  - In the case of improving the robustness of information on UK imports of palm oil from Colombia links should be established with other import partners to determine staging countries and further develop knowledge of UK linkages to Colombian palm oil. The objectivity, reliability and completeness of already established sources of information should be identified to enable the accuracy of, and therefore confidence in, current information to be identified. Connections with the Colombian national and regional governments should be created to develop relationships and ascertain the level of knowledge / data available through them.
- Indonesia
  - Palm Oil - It is possible to quantify the proportion of the threat that is posed by the UK, from the share of total trade in oil palm products that can be attributed to the UK; and generally speaking threats can be classified to a level of certainty appropriate for policy making. However the trade data that

allows for this is not perfect. UNComtrade is the most universal of commodity trading databases. The UN makes recommendations on how all countries should collect, document and manage their trade data. One recommendation, to which the UK does not comply, is that import data should be classified by country of origin or production. The UK is one of only 22 countries of a total of 140 countries that does not classify imports in the recommended manner. It should be noted that UK UNComtrade data do not account for illegal imports and trade. In some areas this may be significant for example the timber industry, although possibly not in the case of oil palm. Also where import partners are identified these may just be staging countries; the UK is one of only a few countries that does not identify the origin country when gathering trade data.

- It is difficult to locate an exhaustive list of UK companies operating or trading in a commodity. A Friends of the Earth report has identified key UK companies that import palm oil or products that include palm oil as an ingredient. This is the best evidence currently available and would appear to include most of the key players. In the changing climate, where palm oil is now featuring more and more as a biofuel, these 'key players' are likely to change, and this will have to be monitored closely in the coming years.
- Identifying the stake in the Indonesian palm market that can be attributed to UK companies, and in identifying specific locations of crops / plantations that are linked to UK imports, is a complex process, and may not be possible at all considering that many of the key UK companies that import palm or use it in their products are unable to trace it back to the source.[143]

- India
  - Cotton - Whilst it is exceedingly difficult to attribute specific area locations or amounts to UK consumption, general conclusions in relation to the areas under production and their relation to G200 Ecoregions can be made. Specifically, the Western Ghats Rivers & Streams and the Rann of Kutch Flooded Grasslands G200 ecoregions contain a larger proportion of land under cultivation for cotton than the other G200 ecoregions.
  - Shrimp – The majority of shrimp aquaculture in India is located in smallholdings and farms of a small area.
- Malaysia
  - Palm Oil – much as Indonesia, however there was a significant amount of spatial data available. Furthermore there are inconsistencies in the UNComtrade data, for example data on the trade flows of palm between Malaysia and the UK are substantially different. This is likely to be due to differences in the methods of reporting. It has not been possible to identify the reasons behind these differences as part of this assessment, but further research could help to establish the differences and to make a judgement on the accuracy of the trade data.

- South Africa
  - Wine - There can be a high degree of confidence in figures given for areas of vine cultivation. This includes precise figures for areas newly planted. However, biodiversity impacts associated with these figures will be uncertain as long as it is unknown whether newly planted land is likely to be valued habitat or recently farmed land. Similarly, there is a relative scarcity of research on biodiversity impacts specific to vine cultivation in comparison to the farming of other major commodities.
  - Accurate spatial data showing precisely where wine is being grown is more difficult to attain as figures for vine cultivation are collated by industry bodies that are less concerned with patterns of production below the wine region scale. As a result GIS datasets showing precise locations were not available.
  - It possible to get up-to-date and reliable data on wine trade between UK and South Africa, as there are no intermediate products and the country of production is always made explicit. There is also well maintained market data showing the quantities of different SA wine brands sold in the UK and so this may aid efforts to more accurately identify biodiversity impacts within SA or even within wine regions. Care must be taken when tracing brand ownership, which can change quite rapidly as the global wine business becomes concentrated into a smaller number of large multinational companies.
  - Finally, we found that the use of Global Biodiversity Hotspots or World Heritage sites may have been more useful for this case study, since the South African wine industry itself has an initiative on biodiversity that specifically relates to the Cape Floristic Region, in which it is known that 90% of wine production takes places.

12.2 Sector Comments

12.2.1 As a component of the study, it was intended to look at sub-groups within the global commodities market. With this in mind three areas were selected:

Palm Oil

12.2.2 This assessment was intended to look at confidence levels for data in the palm oil sector across three countries (Indonesia vs. Malaysia vs. Columbia), the findings of which are:

12.2.3 The amount and sources of the information for different countries was distinctly different. In was particularly noticeable that for two adjoining countries (Malaysia and Indonesia on the island of Borneo) there were different levels of spatial information available. This is particularly intriguing given the amount of publicity this area receives through environmental NGOs (such as WWF and orang-utans).

12.2.4 The sources of information from Columbia was in the main through human rights NGOs and professional palm organisations whilst that of Indonesia and Malaysia were through Government and environmental NGOs.

Lumber

12.2.5 According to UN Comtrade, the UK imported $1,773,676,566 of coniferous lumber in 2005. Of this, $150,968,805 came from the Russian Federation making it the UK's fourth biggest import partner (following Sweden, Finland and Latvia).

12.2.6 However, illegal timber from Russia imported to the UK is seen as a significant problem. A recent report by WWF found that the UK is Europe's largest and the world's third-largest importer of illegally harvested or traded timber and wood products[144]. According to WWF, the majority of this illegal trade (around 2.8 million cubic metres) comes through – or originates from – Sweden, Finland, **Russia**, Estonia and Latvia (the tropical countries of Brazil, Indonesia, Malaysia and central and west Africa account for a much smaller volume). In relation to Russia, the World Bank estimated that illegal logging accounts for 25% of the country's exports[145]. The WWF also contend that exports from Sweden and Finland contain (relatively small amounts of) illegal timber from Russia[146].

12.2.7 According to a report by WWF, most Russian forest products destined for export to Europe originate in the north west of European Russia[147] (including, for example, St Petersburg and Leningradskaya Oblast). According to WWF, north western Russia is characterised by the most intensive wood harvesting in the country but is, at the same time, rich in forest much of which is close to a natural state and is not managed as intensively as forest in neighbouring Sweden and Finland. Unfortunately, we have not been able to specifically identify the areas within north western Russia where logging is most intensive. Interestingly, there are no G200 ecoregions in north western Russia where logging is said to be at its most intensive.

12.2.8 Relatively speaking, the UK does not import a significant amount of lumber from Brazil. According to UN Comtrade data, Brazil is the 19th biggest import partner to the UK for non-coniferous lumber and the 21st for coniferous lumber. However, according to the WWF, the UK is the world's third largest importer of illegally harvested or traded timber and this includes – an albeit relatively small – amount of wood from Brazil[148].

12.2.9 Broadly speaking our investigation indicates that lumber from Brazil can be divided into two categories in terms of origin: non-coniferous tropical hardwood timber from the Amazon and coniferous (pine) or eucalyptus timber from forest plantations located largely in the south of the country. Although some eucalyptus may be exported as a hardwood substitute the bulk appears to be used for pulp production.

12.2.10 According to the International Tropical Timber Organisation (ITTO), vast areas of the Amazon are currently under no threat from deforestation or other significant human-induced disturbance due to their remoteness[149]. However, studies have identified gradually encroaching 'frontiers' of exploration as well as areas where logging is concentrated. These areas appear to be concentrated in the north eastern part of the

Amazon while the western part remains relatively untouched. It should be noted that exports of tropical timber from Brazil are relatively small. As a 2003 report by IIED states, *"wood-based exports are to date embryonic in all but the Southern plantation-based pulp and paper industries"*[150] (see below). Although the UK may import lumber originating in the Amazon its share of total Brazilian exports is relatively small ($5,646,168 as opposed to $232,182,597 for the US according to UN Comtrade). The UK's contribution to deforestation in the Amazon through lumber imports is arguably relatively minor compared to other countries.

12.2.11 Besides its native forests, Brazil has established 6.2 million hectares of plantations (mostly eucalyptus and to a lesser extent pine) in one the most 'successful reforestation program ever seen'[151]. According to Conservation International, much of Brazil's industrial forestry operations are located in the states of Bahia, Minas Gerais and Espírito Santo in the heart of the Atlantic Forest Hotspot. The Atlantic forest covers less than 7% of its original area (although it still harbours a wide variety of biodiversity)[152]. However, according to sources, eucalyptus plantations are primarily located on abandoned agricultural lands, deforestation having occurred earlier[153]. A direct link between deforestation to make way for plantations, the products of which are then exported to countries including the UK is therefore hard to make. Moreover, most eucalyptus is managed to produce pulpwood and paper rather than lumber (although Brail produces just over a third of all the plantation-grown *Eucalyptus* sawlogs in the world[154]). Interestingly, eucalyptus lumber is increasingly exported from producing countries (primarily, Brazil, Uruguay and South Africa) to Southeast Asian countries, for production of FSC certified garden furniture for Europe[155].

India

12.2.12 This assessment looked at the quality of data for different commodities in the same country (cotton and shrimp in India). In this case, the most striking result of our investigations was the lack of any spatial data on the location of aquaculture farms in India. The FAO as published a comprehensive profile of the aquaculture industry in India where much of the pilot information was sourced. This study contained a great deal on information on the extent and total areas of cultivation within India, and described locations (states and regions) in which this activity was most abundant, but this did not seemed to be backed up with any map based or GIS data.

12.2.13 Cotton on the other hand had a significant amount of data based not only on GIS but also maps. This data ranged from point data to areas of regional production including areas under cultivation for other crops. This however highlighted the fact that land is not under exclusive use for the cultivation of one crop, making the attribution to the UK even more difficult.

12.2.14 Ultimately, it seemed the economic interests of other nations in regard to one commodity over another created more data. For instance, the USA has a large soya and cotton economy, as such the USDA would have it in its own interests to monitor the production and cultivation of these products world wide, whereas shrimp production is

much less of an important internal market and as such financial resources may by less abundant, and it would follow that resources dedicated to research shrimp would also be less.

12.3 General Conclusions

12.3.1 The identification of the proportion of ecoregion within country boundary is useful when dealing with specific countries in terms of policy development and trade agreements. However, the importance of this exercise may be questionable - as deforestation for example in one area can potentially effect the integrity of much bigger areas of forest which may not be located within the subject country's boundary. There is an argument that there is a tipping point for mega-forest ecosystems that if reached will have far reaching effects as opposed to local or even regional effects.

12.3.2 Identify threats to Ecoregions – relatively easy to do on the basis of National Geographic/WWF information on the G200. However it is unclear how up-to-date this information is. This is completely reliant on the WWF and may be worth discussing future development of the G200 system with them. The information as it stands is quite broad and probably sufficient for policy making.

12.3.3 Quantifying threats – How much of the country's exports are linked to the UK? This can be achieved to a level of certainty appropriate for policy making; however the data is not perfect. UNComtrade is the most universal of commodity trading databases. The UN makes recommendations on how all countries should collect, document and manage their trade data. One recommendation, to which the UK does not comply, is that import data should be classified by country of origin or production. The UK is one of only 22 countries of a total of 140 countries that does not classify imports in the recommended manner. It should be noted that UK UNComtrade data do not account for illegal imports and trade. In some areas this may be significant for example the timber industry. Also where import partners are identified these may just be staging countries; the UK is one of only a few countries that does not identify the origin country when gathering trade data. UNComtrade data provides imports / export data in monetary value and weight.

12.4 Next Steps

12.4.1 This section outlines the next steps to take to carry on this original and are in the form of recommendations.

Recommendation 1 – Addition of Step 7 – Understanding generic commodity impacts.

12.4.2 A typology of generic impacts, building on the Scott Wilson report on Sustainable Commodities for Defra should be undertaken in order to understand the nature of commodity production impacts and their relevance to policy makers and ecoregion threats. This would provide useful information to policy makers on general impacts

according to a commodity type, for instance, fisheries and by catch, crops and deforestation, mining and pollution.

Recommendation 2 – Addition of Step 8– Impact significance and Verification

12.4.3 Once the generic impacts and the country context are understood, it will then be possible to determine some sort of impact significance of commodity production in each country, or indeed of a commodity globally if that is the direction chosen. Ground truthing and verification are essential to building the evidence base for policy makers and to support broader conclusions that have been made. To ensure a robust measure of significance, the following should be considered:

- In-country issues – the aim is to identify the specific context under which the generic impacts may take place.
    - Each country operates under it's own governance structure, with aid, economic and other factors differing between each. Furthermore, the sensitive areas for each country (national parks etc) will also change, altering the sensitivity of each area to change. These will need to be profiled and understood.
- Global issues – the aim is to establish what the context of the country is in the global community.
    - Countries do not exist in isolation, the relationship between the country and the UK, and the rest of the global community, is vital to understand. This may include trade relationships, treaties and other policy commitments that link with the UK.
- Quantification
    - On the ground measures of impacts, this could include pollution, economic impacts (positive and negative) rates of deforestation, cultivation periods etc. To be carried out in a meaningful way, this will need to be done on a country-by-country bases at the point of impact (a definite role here for WWF and ProForest).
- Stakeholder engagement
    - Many of the impacts felt on the ground will act upon indigenous peoples and other workers. In order to assess the impacts, engagement with these groups will be essential. This will not only help in verification but also with determining the suitability of any mitigation or other solutions.

[136] McNabb (1994). *Silvicultural Techniques for Short Rotation Eucalyptus Plantations in Brazil* Available from: http://www.woodycrops.org/mechconf/mcnabb.html
[137] Available from: http://wfi.worldforestrycenter.org/WF-braz.htm

[138] Available from: http://www.itto.or.jp/live/PageDisplayHandler?pageId=272&sid=302
[139] Available from: http://wfi.worldforestrycenter.org/WF-braz.htm
[140] Available from: http://www.fas.usda.gov/ffpd/Newsroom/Brazilian_Plywood_Production_and_Exports.pdf
[141] Available from: http://www.wri-ltd.com/marketPDFs/Eucalyptus.pdf
[142] Available from: http://www.wri-ltd.com/marketPDFs/Eucalyptus.pdf
[143] FoE. *The Oil for Ape Scandal: How palm oil is threatening the orang-utan*. Available from: http://www.orangutans-sos.org/docs/palm_oil_report_complete.pdf
[144] WWF (2007). *Illegal Logging: Cut it Out* (available at: http://www.wwf.or.jp/activity/forest/lib/IllegalLoggingUK200701f.pdf)
[145] World Bank (2005). *Forest Law Enforcement Governance (FLEG) in Eastern Europe and Northern Asia (ENA-FLEG)*, page 8.
[146] WWF (2007). *Illegal Logging: Cut it Out* (available at: http://www.wwf.or.jp/activity/forest/lib/IllegalLoggingUK200701f.pdf)
[147] WWF (2003). Illegal Logging in Northwestern Russia and Export of Russian Forest Products to Sweden (available at: http://assets.panda.org/downloads/illegloggingswedenrussia.doc)
[148] WWF (2007). *Illegal Logging: Cut it Out* (available at: http://www.wwf.or.jp/activity/forest/lib/IllegalLoggingUK200701f.pdf)
[149] See http://www.itto.or.jp/live/PageDisplayHandler?pageId=272&sid=302
[150] IIED (2003). *Growing Exports: The Brazilian Tropical Timber Industry and International Markets* (available at: http://www.iied.org/pubs/pdf/full/13502IIED.pdf)
[151] See http://wfi.worldforestrycenter.org/WF-braz.htm
[152] See http://www.itto.or.jp/live/PageDisplayHandler?pageId=272&sid=302
[153] McNabb (1994). *Silvicultural Techniques for Short Rotation Eucalyptus Plantations in Brazil* (available at: http://www.woodycrops.org/mechconf/mcnabb.html)
[154] See http://www.wri-ltd.com/marketPDFs/Eucalyptus.pdf
[155] *Ibid*